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Strategic Plan for the Computerization and Connectivity Of Jordan's Primary Schools

Final Report

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This report was prepared by Jesse Rodriguez, in collaboration with Chemonics International Inc., prime contractor to the U.S. Agency for International Development for the AMIR Program in Jordan.

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EXECUTIVE SUMMARY

Enclosed are the findings of a twenty-five day visit to Amman, Jordan, undertaken in September—October 2000, to review the kingdom's educational technology programs. The primary task commissioned by AMIR was to provide recommendations on how to integrate computer and Internet based learning into Jordan's schools and curricula. It can be inferred that twenty-five days is not a very long time in which to get an accurate picture of how the Ministry of Education's technology programs are actually operating. There is some truth to this and, in fact, the purpose of this document is not intended to be all encompassing. However, the purpose of the visit and this accompanying document is to provide guidance on the improvement of delivery of information related services to ensure the Jordan's current and newer generations of school children are computer literate and qualified to take on the new jobs that the ITC sector will generate.

Access to key individuals was provided, each of who were able to provide their perspective on seven key indicators used to evaluate the technology program in place in the kingdom. The following is the list of individuals that participated in the meetings:

- Mr. Steve Wade, AMIR.
- Dr. Khaled Toukan, Ministry of Education
- Dr. Ziad Al-Qadi, Ministry of Education.
- Mr. Zaki Ayoubi, AMIR
- Ms. Maha Khatib, Ministry of Planning.
- Mr. Laith Al-Qasem, Jordan Technology Group.
- Ms. Randa Ayoubi, Rubicon.
- Dr. Bassam Kahhaleh, University of Jordan.
- Dr. M.T. Barakat, Ministry of Education
- Members of the MOE Technology Planning Group.
- Jim Miller, Synectics LTD.
- Members of the ECC.
- Frank Gillis, Canadian Embassy

These individuals were asked to comment on the state of technology within the kingdom in relation to seven critical issues. These issues are as follows:

- Business planning.
- Technology acquisition.
- Training and support.
- Security of information.
- Systems integration.
- Outsourcing.
- Process for continuous improvement.

From the information provided, one can begin to put an accurate composite of the state of technology within an organization. For instance, to the extent that a majority of respondents mirror or diverge on their responses to any one of the issues enumerated above, a pretty accurate assessment, replete with subordinate causes, begins to emerge. Such was the case in with the Ministry of Education.

This document takes each of the seven critical issues and addresses them in turn. Where it is clear that a given course of action would prove beneficial, a strong

recommendation with supporting documentation is included. The following are those recommendations.

Develop A Cohesive Technology Plan

The most glaring finding is that the Ministry does not have a unified technology implementation plan. This might not be immediately apparent since there are technology initiatives in place. However, over the course of discussions with Ministry officials into how these initiatives were put together, it becomes apparent very quickly that the plan came together through a process of compromises and because the initiatives are looked to on an individual basis and not as a part of a cohesive whole with all prior purchases being taken into account so that each succeeding purchase builds on what came before. It is strongly recommended that the Ministry give serious thought to consolidating all technology initiatives and procurement within one department, with outside oversight, with the primary focus of that department being the responsibility for the overall technology initiatives of the Ministry. The head of this department should report directly to the Minister of Education and should be part of the Ministry's decision-making group.

Develop Infrastructure Standards

Infrastructure will determine how well the exchange of information can take place both within the MOE and outside of it. It is absolutely critical that the Ministry implement a stable infrastructure that is consistent across all sites. This process needs to be managed centrally with someone in the central office made responsible to manage all infrastructure related projects and ensure that infrastructure implementation of schools meets agreed upon minimums.

Lease Technology

The Ministry also needs to rethink its strategy for acquiring technology and how it will maintain and support it. Consideration should be given to the leasing of equipment instead of the current practice of buying the equipment outright. Amongst the many benefits of leasing is the ability to procure services that the Ministry cannot easily accomplish itself without great cost. Also, leasing provides for an equitable distribution of technology across a greater number of sites. Clearly, leasing at this point would prove problematic for the Ministry due to legal and economic barriers. Yet, this should be the goal and the Ministry should try to exert influence to make leasing an option.

Develop Process Standards

As the Ministry continues to invest in its technology infrastructure, it should do so with the idea of reducing total cost of ownership. Standardization will allow for economies of scale, which should reduce the overall amount of resources expended on technology. It will also make it easier to train and support end-users. The Ministry should standardize on a manufacturer for each major equipment component, i.e., computers, routers, switches, printers, etc. Decide on a database standard and mandate that all future purchases, which require access to a database, adhere to this standard. Purchase a help desk system that is compatible with the agreed upon database standard and begin the task of building a support database that will be a repository of the knowledge gleamed through the process of providing on-going support. Acquire hardware and software with "smarts" built in to reduce support costs. Again, it is understood that there may be some legal and political ramifications associated with this course of action, but it should be the goal of the Ministry to bring this about.

Replace the Current Financial - Human Resource Management System

The current application does not meet the needs of the Ministry and there is a concern that the internal resources are not there to keep the current internally developed system operational. It should be replaced with a commercial client server based application that runs on the agreed up computer equipment and database standard. SAP or PeopleSoft are good candidates. Should the Ministry choose to go out and acquire a new financial-human resource system, it will need to negotiate an outsourcing contract. Included in this document is a section on outsourcing, which should prove helpful in developing an RFP and the subsequent management of the contract once the RFP is awarded.

This document will emphasize the need for the pervasive need to standardize the technology infrastructure wherever possible across the entire Ministry, including its outlying directorates and schools. This emphasis comes from the belief, which is also held by Ministry officials, that the goal of the Ministry should be to reduce the overall operating costs so that effective teaching and learning can take place, even though technology costs, in the form of technology acquisition and training and support, go up.

Finally, this document should be viewed as the first of many processes that the Ministry will need to undertake. It should be noted that while there are numerous recommendations contained within this document on how the Ministry should restructure itself to prepare to effectively use and manage information technologies, much of what the Ministry needs to do to make these recommendations a reality is simply not possible today due to practices and processes in place today as well as the lack of necessary expertise. It is recommended that the next phase for the Ministry to concentrate on is the development of the business plan. This next phase is critical to the successful development of an IT infrastructure for the Ministry. It is in this process that the Ministry goes from deciding what it wants to do to how it wants to do it. With the development of the business plan, the Ministry will be able to develop timelines, acquire resources – both external and internal – making possible not only the implementation of many of the recommendations contained within this document but also bringing into play the other initiatives that the Ministry is currently working on which are not technology related. This process will build the "depth" necessary to move the Ministry forward and will require a strong commitment on the part of the Minister and his staff. It will also require that outside expertise be brought in to develop the actual timelines and assist in the complex task of building the communications infrastructure that the Ministry will need in the coming years. In short, this process will have a tremendous amount of detail as to who is responsible for what, when things will be completed, how resources will be allocated and where the ministry should be in any given point in time throughout this process.

Any comments, questions or concerns can be directed to Jesse Rodriguez at jesse@eddsnet.com.

BUSINESS PLANNING

The future holds that effective learning will require that information be available anytime, anywhere. This, in turn, will force educational institutions to give serious thought to how future technology acquisitions will make possible the interaction and free flow of information among students, educators, parents, the local community, and, increasingly, the global community. Inherent in all this will be the need for a communications infrastructure that will allow all manner of devices to tap into information resources in a variety of ways, i.e., Inter- and Intranets, satellite, cable, and wireless.

There are several challenges that must be addressed the Ministry in order to ensure that a successful network capable of supporting all manner of users can be implemented. They are:

- What technologies will be purchased and used?
- How will technology be kept relevant over time?
- How will the curriculum and technology be integrated?
- What safeguards will be needed to ensure appropriate access to information?
- Ancillary issues that will have an impact on a successful technology implementation.

These five broad issues are closely intertwined and how one approaches and resolves any one of these will have repercussions for the other four.

To begin with, the Ministry will have to decide how central technology will be to the organization—both instructionally and administratively. Looking at the world around us, there are significant shifts pointing to most forms of communication and information flow becoming digital in nature. One of the most important processes that an organization can undertake is to develop a cohesive plan for the implementation of technology. The emphasis of any plan should be on what an organization wants to accomplish and not on the how it will accomplish it. Organizations should look to acquiring technology not as a means of creating a specialized program, such as notebook program for instance, but as a way of bringing efficiencies to the organization and as a means to provide value-add to both internal and external constituencies. Technology acquisition strategies should be strategic not tactical as a means of providing high-value services and staying adaptable to constantly changing needs. Each technology purchase should be viewed with some thought as to its potential use outside of its immediate purchase purpose.

The following questions need to be asked:

- How do this purchase and or program fit into the overall goals of the organization?
- Will the technology be evolutionary to what is already in place or will it require drastic new competencies from staff? What are the budgetary implications?
- Is the technology adaptable? To the best of our ability to foresee the future, will this technology have staying power or will it require replacing as new standards emerge? Should we implement now or wait?

Probably the most important challenge public institutions face today is the ability to view technology as core to their organization's ability to function. Few have looked

to their regular capital or maintenance and operations funds as a means of funding technology. Even fewer have instituted programs, such as perpetual leasing of technology, to ensure on-going technological relevance. Much of the technology purchased is done so through one-time or uncertain sources of money such as grants, bond or over-ride programs, and donations, both private and corporate. This does not bode well for educational institutions as increasingly, an organization's ability to survive and thrive will depend upon its ability to rapidly gather, manage, and communicate information well. The future holds a grim form of digital Darwinism for organizations not ready for this change.

The logical next step is to determine how technology can assist in accomplishing the stated goals. Integral to this step is the development of a feedback mechanism designed to measure the effectiveness of any given technology initiative and allow for changes to take place to accommodate for new requirements as they develop. In addition, to bring order and structure to the organization, the business plan should provide for the institutionalization of common business practices and funding support. From a technology standpoint, there can be no more important set of business practices than those dealing with the setting of standards to assist an organization in achieving economies of scale and implementing relevant support mechanisms. ***Appendix A*** provides some thoughts as to how institutions should evaluate the true value of Information Technologies (IT). The other side of the coin to technology issues is personnel issues. No matter how good a technology plan is it can only be as good as the personnel tasked with designing, building, supporting and maintaining complex information systems. How well an organization has planned for the recruitment, retainment, and certification of its information systems personnel will determine the success of its technology program.

Frankly, the Ministry of Education (MOE) faces serious problems in each of these areas. The reasons are complex and intertwined but some indicators begin to emerge by reading the MOE's technology initiatives and face-to-face discussions with MOE staff, and others outside the Ministry.

What follows are specific recommendations for the development of sound business plan for the MOE.

REORGANIZE TECHNOLOGY SERVICES

Thought should be given to creating one department responsible for the management and support all information systems within the organization. The argument against this recommendation conceivably will be that there are different needs within the Ministry, both instructionally and administrative—that each of these areas supports different functions within the organization. While on the surface this might appear to be a persuasive reason for continuing the status quo, the problem is that this structure is not meeting the needs of the organization.

To begin with, there will be a duplication of effort. In addition, this arrangement does not lend itself to the creation of a centralized knowledge base, which support staff can tap into to provide assistance to end-users. Finally, the potential is there to have individual groups get into direct conflict with each other as they jockey within the organization for status and resources. It is clear that the current structure has been designed around individuals and not around processes and this is hurting the MOE's ability to provide good service in a cost-effective manner.

Included in this document is a proposed technology services reorganization contained in ***Appendix B***. It is similar to the one currently being proposed by staff but provides for a more streamlined operation. The MOE, when looking at the sum total of employees in the technology support areas, is well staffed in terms of total full-time technology support personnel (FTE's). The emphasis of this proposed reorganization is on providing more support staff and increasing the number of programming staff by combining groups and redistributing FTE's. This proposed reorganization when tied to some of the other recommendations on this report lends itself well to keeping the status quo in terms of total technology FTE count for the organization and streamlining operations thus offering more timely and better support. ***Appendix C*** provides basic job descriptions for the recommended positions.

DEFINE THE INFRASTRUCTURE

All too often, long drawn out battles are fought over the types of equipment which will end up on the desktop without a great deal of thought being given to the communication infrastructure necessary to make technology viable.

Infrastructure here is defined as the communication network composed of wiring, wiring patch panels and communication rooms to which all computer equipment, i.e., servers, PC's, hubs, routers, switches, will connect to. Implemented correctly, infrastructure should last 20 or more years. It cannot be stressed enough how important it is for the MOE to establish a stable infrastructure for its information systems. The real value to any organization is in the exchange of data and information. The MOE should, therefore, reexamine its current infrastructure strategy and design a long-term strategic plan that calls for the MOE to provide a set of guidelines detailing the minimum equipment and cabling requirements necessary to bring directorates, service centers and schools on-line.

It is important that the MOE understand how important infrastructure really is to its long-term ability to effectively build a data driven information system. Infrastructure is the "highway" on which information will flow. By way of example is the need to ensure that the MOE have wiring standards in place.

First, without central control for ensuring that wiring standards are met and that each site's cabling plant falls within the greater MOE plan, cabling will become a hit and miss process. Cabling should be viewed as core to the smooth functioning of the entire organization and not as something that individual schools need to grapple with. A strategy should be developed which will ensure that cabling comes under the central authority of the MOE. It may well mean that schools will need to set aside monies that can be pooled to provide economies of scale and ensure that MOE wiring standards are adhered to. Of course, the MOE may wish to handle this from other sources. Regardless, the organization needs to develop a plan and funding formula for wiring all the classrooms and offices within each school.

ESTABLISH BUSINESS PROCESS STANDARDS

A criticism made of educational and administrative technology acquisitions has been that there has not been a very good return for the investment made. In fact, this issue came up at the ECC meeting where the Minister presented his operational plans for the Ministry. To a large extent this can be attributed to the haphazard way in which educational institutions make technology-purchasing decisions. It has been the practice to allow schools and departments a tremendous amount of flexibility in

the purchases made with their respective budgets. This will no longer work for the Ministry as more money is infused on technology and it becomes more dependent on it for both administrative and instructional functions.

The challenge for the Ministry will be to develop standards that ensure that it can acquire appropriate technology at the best possible prices, which can be economically supported and maintained, while at the same time providing some flexibility to meet the individual needs of schools and departments.

It is recommended that the Ministry set up a committee which reports directly to the Minister of Education to begin the process of establishing standards for both hardware and software purchases. This committee should be chaired by the director of technology and composed of individuals from school sites, departments, universities, and the private sector. It is possible, that within this group a sub-committee may need to be set up to evaluate instructional software standards and purchases as well. Some method will need to be developed to capture the information being created by all these groups. ***Appendix D*** contains information regarding After Action Reviews that could be employed by Ministry staff and its committees to create a common database of problems encountered and how they were resolved.

An additional sub-committee, composed of information technology professionals, should also be formed to evaluate the establishment of database standards for the Ministry. Originally, the Ministry's strategy of relying on ODBC as a means of facilitating the exchange of information between a mixed environment of Windows 2000/SQL and Unix/Oracle, while technically possible, would have worked as well as having native access to the MOE's databases. Considering the investment the MOE has made to Microsoft's Windows operating systems and applications, the decision to standardize on Microsoft's SQL database is a wise one. This strategy will work extremely well once the MOE begins to distribute its information resources out to the directorates and individual schools where it had been the Ministry's intention to use Microsoft's SQL anyway. The short-term disruption caused by moving to a new database standard should be offset by the long-term benefits of a database, which is integrally tied to operating systems and applications already in use by the organization as well as the other applications being recommended later in this document. Additionally, having a unified architecture brings reductions in support and maintenance costs.

INSTITUTE EFFECTIVE PERSONNEL PRACTICES TO RETAIN KEY PERSONNEL

Some thought should be given to the current compensation being offered the MOE's information systems professionals, especially programmers and technicians. The current compensation being offered to this group is not adequate which will make it difficult to attract and keep qualified personnel. Technology is becoming much more complex to implement, especially as the MOE begins to bring up the wide area network, and will require qualified individuals to run it, even with the advantages provided by the recommendation later in this report to buy equipment and software with "smarts" built in. Compensation is only one aspect to the problem, however. The MOE should develop a plan to retain those individuals that it has that are doing a good job for the organization. The dichotomy facing organizations today is that as technology becomes easier to use, it is becoming much more complex to implement, especially as schools begin to bring on line wide area networks.

Compensation is only one aspect to the problem, however. An organization should develop a plan to retain those individuals that are doing a good job. One of the ways to do this is to provide funding that will allow these individuals to gain or keep certification in their respective fields. It should be noted that it costs an organization less to keep a qualified individual over the long term than it does to hire and train a replacement. Finally, outsourcing will become a necessity at some point and this is addressed in the Outsourcing Section of this document.

To summarize, a good business plan will deal with the following:

- **Separate the what from the how in developing a business plan:**
  - **What is to be accomplished?**
  - **How can technology assist in accomplishing the stated goals?**
- **How will it be measured?**
- **Who is responsible?**
  - **Who sets hardware standards?**
  - **Who sets software standards?**
  - **Who provides direction?**
- **Define the infrastructure.**
  - **Centralize wiring to ensure MOE-wide consistency.**
  - **Ensure equity across the MOE.**
- **Establish business process standards:**
  - **Standardization vs. individual initiative.**
  - **Hardware.**
  - **Software.**
  - **Database schema.**
  - **Funding support.**
- **Personnel issues:**
  - **Recruitment.**
  - **Retainment.**
  - **Certification.**

Technology Acquisition

The MOE currently has three technology initiatives in progress:

- Build an Intranet to connect all the schools and administrative directorates back to the Ministry of Education. The initial phase of this initiative will be to connect 900 schools with 20 PC's each (1 of the PC's will be for administrative use.)

- Multi-media project. This will be comprised of two sub-initiatives – training and multi-media. The main thrust will be for teachers and administrators to use the Internet to get to content for core curriculum courses. Tied to this will be a training component on how to use the Internet to gather and prepare content.

- Purchase computers for teacher home use. Under this project, 20,000 PC's will be made available for teachers to purchase for home use. The program's intent is to make it affordable for teachers to purchase a computer and pay it off from their salary over a 2—4 year time period.

A major issue facing all educational institutions is how to keep their technology relevant. The MOE is no exception. The current strategy employed by the MOE is to purchase the needed technology outright. The problem with this strategy is that, after just a few years, there is little to show for the expenditures. Computer equipment rapidly becomes obsolete and purchases made at a later date often do not mesh well with that which is already in place making support of the technology infrastructure not only more difficult but more expensive as well. The MOE should seriously consider leasing its computer equipment. Furthermore, thought should be given to standardizing on specific vendors for the different types of computer equipment needed.

THE ADVANTAGES OF LEASING

Clearly, there are some hurdles to making leasing a viable option for the MOE. It would appear that, currently, leasing is not allowable by law—though this wasn't entirely clear. Also, the MOE is mostly dependent on grants for its technology acquisitions and has not integrated technology as a core component and therefore does not have a line item on the budget to accommodate for technology acquisition, support and replacement. What is suggested here is that some thought be given to making technology core to the MOE and that a stable, long-term funding process be established to ensure the viability of the MOE's information systems over time.

Leasing technology provides several distinct advantages. First, it will allow the MOE to purchase more equipment up front. Conceivably, the MOE could purchase all the equipment slated for purchase over a three-year period during the first year. Pricing would most likely be better as the MOE could negotiate a better price per computer based on a larger number of computers being purchased up front—which should offset much of the interest paid on the lease, making the total cost of acquiring the computer a wash between a direct purchase and a lease. Additionally, such a strategy would deal up front with the issue of equity by ensuring that all schools would receive new computer equipment at the same time. Also, this would go a long way towards making hardware and software support easier since staff would only have to support one type of computer with the same capabilities across the entire

organization as opposed to the current practice of trying to support a broad spectrum of computer types, makes and models with differing capabilities.

Leasing also allows an organization to plan for the replacement of its technology infrastructure. With the ever-shrinking budgets that schools face, technology has become essential in the day-to-day operations of an organization as a means of bringing efficiency, automation and cost containment to the organization. Organizations that view technology acquisition as a one-time thing do so at their own peril. Leasing provides the mechanism to institutionalize the need to stay technologically relevant by providing for the planned replacement of technology and addressing the ever-increasing rapidity of equipment obsolescence. It used to be that equipment could be migrated down from high schools to middle schools to elementary schools. Back then computer equipment was more capable than the software designed to run on it. That is no longer the case. As an example, if we look at hardware requirements that Microsoft Office 2000 imposes one can see that a Pentium class computer with considerable RAM is a necessity to run this suite of programs efficiently. The MOE has standardized on Microsoft Office. Software is firmly in the driver seat and will become more so as the melding of voice, video and data continues to accelerate.

Clearly, this will have an impact not only on computers, but the servers, hubs, switches and routers to which these computers connect. Leasing addresses these issues. The MOE should entertain the notion of refreshing their equipment at the end of the lease period. Compaq Computer Corporation, a leading manufacture of computer equipment, has a very compelling program called EduFlex which allows a organization to lease all types of computer equipment from different vendors under one convenient lease agreement. The requirements are that 51% of all equipment being leased be from Compaq. The remaining 49% of the equipment can be from whomever the MOE chooses, i.e., Hewlett-Packard, Cisco, etc. One added benefit of the EduFlex program is that should the MOE choose to refresh the lease at the end of its term, Compaq imposes no interest charges on the current lease. If on the other hand, the organization chooses not to refresh, the interest charged is only on the last year of lease at the prevailing interest rate.

Finally, services can be bundled with a lease. Maintenance contracts, for instance, can be made a part of the lease. With large purchases of equipment, the MOE can negotiate favorable terms on such contracts by requiring and getting better pricing on maintenance than the standard maintenance charges imposed by computer manufactures which base their pricing as if the organization were only buying one computer and taking out maintenance on that one computer. In addition, because these leases will probably be for large of amounts of equipment, the MOE can ask for and receive services free of charge or at a very reduced price in such areas as staff training, consulting services, etc. Also, as lean as the MOE is on technical staff, hardware and software setups can be part of the lease as well as the removal of equipment at the end of the lease. These are all costs that an organization bears but which are rarely factored in at the time that computer equipment is acquired. For a more detailed review of how leasing programs work, visit the Compaq Education Leasing Web site at www.compaq.com/education/k12/purchasing/eduflex.html.

STANDARDIZATION OF EQUIPMENT

Integral to the idea of leasing is the concept of standardizing the equipment to be purchased by the MOE. Standardization offers distinct advantages. The current MOE

strategy for acquiring computer equipment is to purchase based on the lowest bid. The strategy should be to look at total cost of ownership of any equipment purchase and not just the purchase price. A more appropriate approach would be to select a manufacturer of equipment based on criteria beneficial to the MOE. Once that is done, the selection of a dealer to provide the needed equipment can be made through the bid process with the award going to the dealer providing the best pricing for the equipment and services proffered. Selecting a single vendor for a particular type of equipment should allow the MOE to exact better pricing for equipment. For example, using the current initiatives that MOE is working on, it would behoove the Ministry to bundle, if possible, the initiatives to purchase school and teacher workstations. Instead of 18,000 desktops for students and 20,000 desktops for teachers, each being tendered separately, the initiatives could be combined to get a better per unit pricing model from a successful bidder. Based on a discussion with Dr. Toukan, it appears possible that the Ministry can indeed standardize on a specific brand so long as there are three or more sources for that brand available. This recommendation requires serious consideration.

Another advantage, alluded to in the leasing section of this document, is that it will be less costly for the MOE to support the equipment of one manufacturer than to try to support the equipment of multiple manufacturers. Also, MOE staff need only acquire the functional expertise on the offering of one computer manufacturer, for instance. This same line of reasoning applies to stockpiling replacement parts. The MOE would only need to keep parts on a select group of equipment instead of, for example, three types of hard disk drives for three types of computers made in three separate low bid purchases.

Finally, by standardizing the MOE can lay the foundation for a structured approach to building its information systems infrastructure. Future purchases can be made with a high degree of confidence that they will mesh well with the purchases that came before. This also lends itself to the potential of a fruitful relationship with the equipment manufacturer. Over time, the organization can benefit from additional services, such as access to the long term strategic plans of the manufacturer as well as potentially play a role in the future development of products.

To summarize, leasing offers the following advantages:

- **Allows an organization to purchase equipment up front.**
- **Allows a organization to plan for replacement of technology:**
  - **Addresses rapid obsolescence of equipment that is now less than 3 years.**
  - **Deals with the limited ability to cascade equipment downward.**
- **Allows a organization to bundle services:**
  - **Maintenance contracts.**
  - **Removal of equipment at end of lease.**
  - **Hardware and software setups.**

Training and Support

Training and support is an area that organizations have historically not funded adequately. There are three strategies that the Ministry of Education should undertake to address this deficiency. First, as this document has emphasized repeatedly, the Ministry should standardize the hardware and software it uses with particular attention given to standardizing the desktop configuration of the PC's. Second, the Ministry should acquire and use a true help desk to provide support to end-users as issues with hardware and software applications arise. With a help desk, the organization can develop a database of common solutions as well as use the system as a means to receive feedback on the support being provided. Finally, the Ministry should look to acquiring technology to assist in reducing total cost of ownership as it goes about providing training and support.

STANDARDIZE HARDWARE AND SOFTWARE SETUPS

Having the same hardware and software across the organization means that the organization can employ tools and strategies not possible with a myriad of equipment from different manufacturers or software designed to accomplish the same function. By way of example, assuming the Ministry had settled on Compaq DeskPro EN's as a computer standard, it could acquire Symantec's Ghost, a software program that would allow the duplicating of a disk image that could then be replicated across all newly acquired machines or on machines that needed a refresh of the current image. It would be easier and take less time to troubleshoot problems if all the machines had the same image. For more information on this product, go to http://ghost.com. Another fine product is Microsoft's System Management Server (SMS). SMS works similarly to Ghost but requires more expertise to use effectively. However, since the MOE is already using Microsoft products, this product should be seriously considered for use by the MOE. It could easily be used in conjunction with Symantec's Ghost program. For more information on Systems Management Server, visit Microsoft's site at http://www.microsoft.com/smsmgmt/exec/default.asp. Of course, the MOE could also require that the successful bidder of computer equipment provide the MOE with equipment that has a preinstalled image that the wants on each machine.

The same holds true for application software. It becomes easier to support application software if the installation is the same across all machines. Having the same versions and patches on all Ministry PC's makes it easier for support staff to troubleshoot problems. It also helps to reduce the amount of courses needed to train staff. For example, if there are two different versions of Word in use by the Ministry, staff now has to develop two training sessions to support users of each. In addition, the exchange of information becomes more difficult to accomplish.

As the MOE has standardized on Windows for the desktop, it would do well to develop a common look for all desktops in use across the organization, broken down broken down by levels—central office, directorates, individual schools, etc. Using profiles to lock down the desktop would ensure that the settings could not easily be modified. This will make it easier for support staff to provide assistance often in a relatively short period of time since the investigative process need not include a review of what applications the end-user may have installed on his or her machine, which could be causing a conflict with other core applications. One added benefit to using profiles is that the MOE can feel some degree of confidence that the software installed on the organization's PC's are actually owned by the MOE. To be charged with using software illegally is the last thing the MOE needs. It would behoove the

MOE to consider passing a policy that stipulates that no software, which the MOE or its schools does not own, is to be installed on MOE owned machines. ***Appendix E*** provides an example of a policy that deals with computer software copyright that might prove useful to the MOE.

With this in mind, the next question to be addressed is how technology and the curriculum will be integrated? This question has proved itself a great conundrum to education. Certainly, part of the answer is that education must come to depend on technology as a key component to the educational process. Put another way—if the information system isn't functioning properly, education can't take place. To get us to that point will require that staff be sufficiently trained and that their be a support infrastructure to assist these folks. Also, there will need to be much more equipment in place to allow an organization to depend more on technology as a means of delivering content to students. There will also be a need to move away from an environment where the teacher is the primary provider of information to one in which the student takes on that primary role with the teacher acting as guide and mentor.

Along the way, schools will need to do the following to ensure a successful transition.

IMPLEMENT A HELP DESK

The Ministry should acquire help desk software. Currently, when a support call comes into the Ministry, it is funneled to individuals within the organization in an unstructured way for resolution. Not only does this mean that there is no consistent quality of service because each individual handles the requests differently, but also there is no knowledge base from which to draw from. Instead the reliance is on the knowledge contained within each support staff member's head. One can only imagine the amount of knowledge that is lost each time a staff member leaves the MOE's employment rolls. A better solution is necessary.

The advantage of a true help desk is that it enables an organization to capture the knowledge necessary to provide support on hardware and software issues. This knowledge is captured to a database that can be contextually searched by anyone with access to the program. In addition, a help desk can act as an instrument in assisting staff to develop the necessary training programs. This is accomplished by reviewing the number of help calls coming in to the help desk group and categorizing them. For instance, staff may find that 30% of the calls deal with the question of how to create tables in Microsoft Word. With this information, the application support group can tailor a staff development program dealing with tables in Word. Also, a good help desk system provides for automatic notification of work order status and the creation of surveys, which are sent to end-users asking them to rate the support they have received. This allows management to use this tool as part of the employee evaluation process. Finally, it provides factual information, which can be used to make a case for additional resources to provide an adequate level of support.

The Ministry might want to look at SupportMagic from Network Associates as a potential help desk package. Besides being a comprehensive help desk system it also dove tails nicely with the recommendation to standardize on a common database schema. This software also runs on top of Microsoft Windows 2000 and 2000 SQL database, which the organization plans to use. Their web address is http://www.networkassociates.com.

The latest version of Magic Solutions' top-rated product, SupportMagic, offers growing companies easy integration with major desktop management systems, to provide a centralized help desk system that accelerates problem resolution and lowers the total cost of ownership.

LOOK TO THE WEB FOR CONTENT

There should be someone in the Ministry tasked with finding the appropriate resources to redefine the curriculum so that cognitive content and technology mastery objects are provided in a seamless and thematically integrated series of curriculum units. It is important to note that where most programs fail is in not providing teachers with appropriate related instructional material. Some excellent, free Web-based resources include:

- http://thegateway.org - sponsored by the U.S. Department of Education's National Library of Education, this site offers a list of free lesson plans and educational content searchable by grade and subject.
- http://spacelink.nasa.gov/ - Main NASA site for Education.
- www.loc.gov/- Library of Congress home page.
- www.ajkids.com/ - Popular metasearch site for students.
- www.k12.msn.com/default.asp - Microsoft Lesson Connection.

Most lesson plans "adopted" from the Internet will need to be "adapted" for the Ministry's particular lesson needs and objectives. In the following example, the web was scoured to create an integrated thematic unit in Geometry. In all likelihood, of the many lesson plans included here, only one small part of the actual lesson would be used and, more than likely would not be used in the way the plan was originally written. It will be incumbent on Ministry or school staff to use and modify with good common "teacher sense" as you do with other activities.

EXAMPLE: INTERNET BASED GEOMETRY LESSON PLAN RESOURCES

Geoboard Activities—**Background for Teacher**
http://www.kutztown.edu/~fithian/Geometry/Activity-03.html

Quadrilateral Classification—**Background for Teacher**
http://www.kutztown.edu/~fithian/Geometry/Activity-04.html

Lesson 1: Tangrams—Characteristics of Polygons
http://www.dpi.state.nc.us/Curriculum/Mathematics/Mth.LssnPlns/Mth.4.2.1

Lesson 2: Pattern Blocks and Geoboards: Properties of Polygons
http://www.iit.edu/~smile/ma8917.html

Lesson 3: "Shapes" from *A Light in the Attic* by Shel Silverstein

Lesson 4: Road Signs
http://www.dpi.state.nc.us/Curriculum/Mathematics/Mth.LssnPlns/Mth.4.2.1

Lesson 5: Geoboard Polygon Property Game

North Carolina Math Curriculum
http://www.dpi.state.nc.us/Curriculum/Mathematics/Mth.LssnPlns/Mth.4.2.1

Lesson 6: Speaking Mathematically
http://explorer.scrtec.org/explorer/explorer-db/rsrc/820890037-81ED7D4C.2.PDF

Lesson 7: Polygon sorting by Attributes
http://www.dpi.state.nc.us/Curriculum/Mathematics/Mth.LssnPlns/Mth.4.2.1

Lesson 8: Building Polygons
http://www.dpi.state.nc.us/Curriculum/Mathematics/Mth.LssnPlns/Mth.4.2.1

Lesson 9: Pick the Polygons
http://cesme.utm.edu/resources/math/MAG/3-5MAGActivities.pdf/3-5C5A2.pdf

Lesson 10: Perimeter of Polygons
http://www.mathgoodies.com/lessons/vol1/perimeter.html

Lesson 11: Area of Polygons
http://www.mathgoodies.com/lessons/vol1/area_rectangle.html
http://www.mathgoodies.com/lessons/vol1/area_parallelogram.html
Assorted Sports, Lesson 11 Extension Activity
http://score.kings.k12.ca.us/lessons/sports.htm

Lesson 12: Area and Perimeter of Polygons
http://www.iit.edu/~smile/ma9615.html
http://www.iit.edu/~smile/ma9509.html
Extension Activity 1, Lesson 12
Finding Area and Perimeter in a Miniature House Using Standardized Units
http://www.iit.edu/~smile/ma9112.html
Extension Activity 2, Lesson 12
Maximizing and Minimizing the Area of Rectangles Given a Fixed Perimeter
http://www.iit.edu/~smile/ma9601.html

Lesson 10-12: Assessment
http://www.mathgoodies.com/lessons/vol1/challenge_vol1.html

Lesson 13: Cheez-It
http://cesme.utm.edu/resources/math/MAG/3-5MAGActivities.pdf/3-5C2A4.pdf

Lesson 14: Measure Up
http://cesme.utm.edu/resources/math/MAG/3-5MAGActivities.pdf/3-5C5A6.pdf

Geometry Unit Enrichment:
Bridges to Math Comprehension
http://score.kings.k12.ca.us/lessons/bridges.html
Blacktop Games
http://www.nsa.gov:8080/programs/mepp/es/geom01.html

The underlying question becomes, "How shall we prepare our staff, as well as our curriculum, instruction and assessment practices, to take full advantage of the efficiency of such systems remembering that the key questions are?"

- How is my student doing?
- How is the class doing?

In addition, it would be prudent for the Ministry to do a self-assessment and ask the following:

HOW TECHNOLOGY-SAVVY IS YOUR TEACHING PORTFOLIO?

- How do you currently store assessment scores and artifacts? How accessible are audio, video, multimedia, and performance assessment materials?
- Do you have timely access to aggregated/disaggregated data for comparison purposes? How do you sort, organize and display the data so that it facilitates analysis?
- How many times do you repeat the same data output? Report card heading info? District and school forms? Individualized Education Plans? Lesson plans? Student Study Contracts?
- How can you streamline and organize anecdotal observations of student learning?
- How do you archive successful lesson plans, activities and assessments? Is the majority of your professional library at home or at work?
- Do teachers, parents and students have immediate access to many examples of student work, anchor and/or exemplary work samples?
- How do you communicate progress and/or assessment results to parents? To students?
- How do you manage the enormous amounts of data that schools are required to collect as well as the additional data the school wants to collect?
- Is accountability high on your priority list? Do you have your own copy of the standards for each subject area you are teaching? Do you reference them when planning, teaching and learning?
- How do you manage the grading and reporting process?
- How and when do you collaborate with other educators? Look at student work? Share assessment practices and insights? Share professional dialogue?
- What's missing in your current method of storage and retrieval of data about student learning?

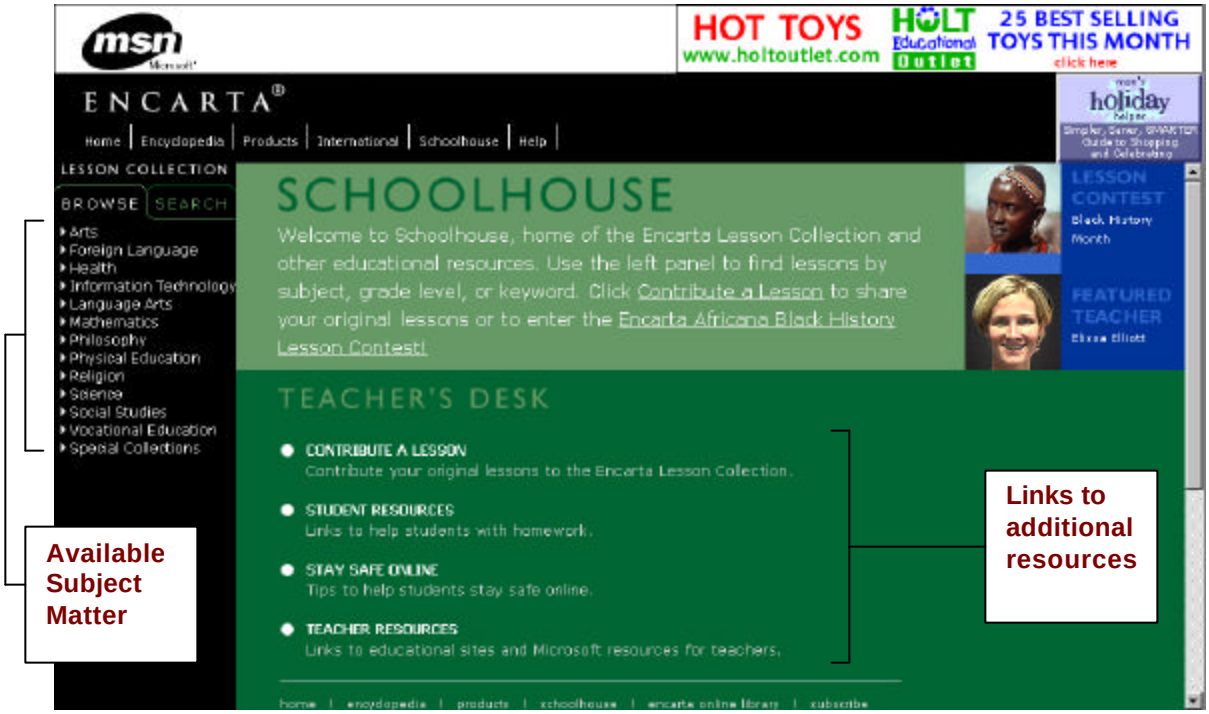
The MOE should also look to commercial software available to meet some instructional resource needs. In keeping with the stated direction of the Ministry to use Microsoft products, it would prove useful for the Ministry to look to Microsoft developed reference products to complement the curricula. The following list, while not exhaustive gives some idea of the excellent resources available from Microsoft:

- Encarta
- Bookshelf
- Ancient Lands
- World Atlas
- Dangerous Creatures
- Musical Instruments
- Multimedia Strauss, Schubert, Mozart, Beethoven

Let us look more closely at one of the reference suites—Encarta. Not only is Encarta a very powerful encyclopedia because of the content found within the program but also because of the resources available to an educator off the Web. In talking to the staff, while they were aware of Encarta, it became clear that they were unaware that there was a wealth of support material available on the Web at a site dedicated to Encarta. This site, which incidentally is located at http://www.encarta.msn.com, contains monthly updates to the encyclopedia that can be downloaded and installed to keep information up to date. In addition, there are lessons on a variety of subject matter that can be downloaded and used in conjunction with the Encyclopedia. There are even helpful links to other sites that students or teachers can access for assistance.

Clearly, this is an important resource for both teachers and students. There are clearly many others on the Web. The organization needs someone on staff to find and package these resources for use throughout the MOE and its schools.

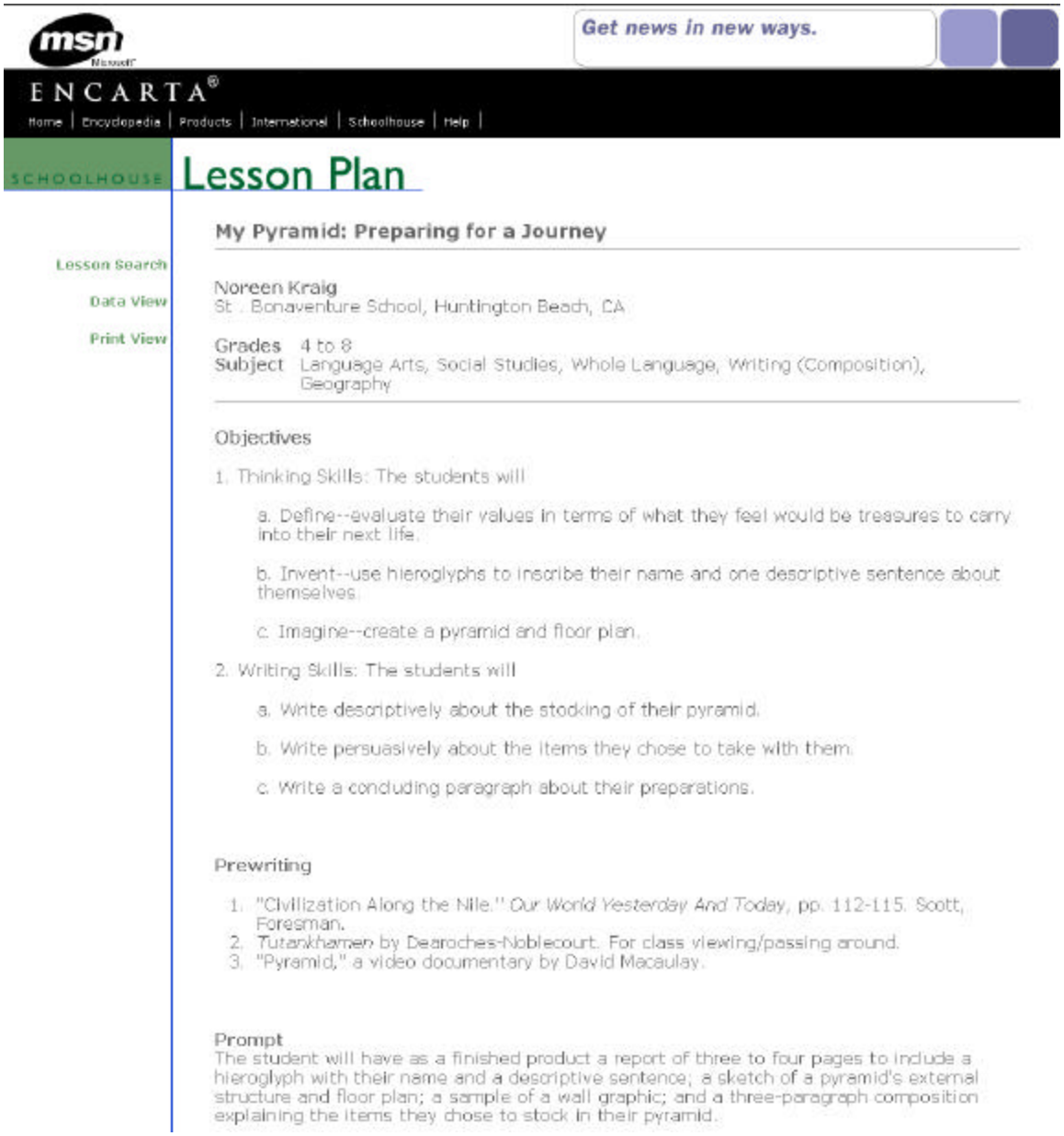
The following image was taken from the Encarta Web Site:



A key concept to keep in mind is that Microsoft has developed a link between the static content of a CD based reference tool like Encarta with the dynamic nature of the Web. Each month, new content is added to the Encarta web site, allowing teachers and students to stay current with the changing world we live in. This is quite a contrast from the traditional way that reference materials are normally used—an encyclopedia is written and the information remains static until a new edition is released.

The following pages will provide more detail on how Encarta on the web provides educators with a wealth of resources to assist in the teaching and learning process.

As an example of the comprehensive resources available to users of Encarta, the following images detail a lesson plan taken from the Language Arts section. It is an example of one of several lessons that address writing composition.



The lesson plan is broken down into its component parts to assist the teacher.

Precomposing

1. Two class periods will be spent in small group activities using five learning centers.

   a. "Pyramid," by David Macaulay. Book available as a refresher on building a pyramid and setting up the floor plan.

   b. "Fun With Hieroglyphs," an activity program by Catharine Roehrig which can be used for the hieroglyphs themselves or as inspiration for designing "new" hieroglyphs.

   c. Coloring Book of Ancient Egypt which can be used for the tomb graphic or as inspiration for the student's creative design.

   d. *Tutankhamen*, by Dearoches-Noblecourt.

   e. "Tutankhamen's Treasures And Egypt Today." *National Geographic* 151 (March 1977).

2. Double Clustering: first identifying items stocked by the ancient Egyptian kings, then extending the cluster to reflect the needs and treasures of today.

Writing
The students will be assigned the completion of their rough draft in three days as part classwork, part homework.

SHARING: Using writing groups to share rough drafts.

a. Emphasize positive comments (what you enjoyed the most, considered the best part, etc.).
b. Question any parts you did not understand.
c. Allow time to return to desk with individual papers and ink in revision ideas, areas that need clarification, etc.

REVISING: Working with a partner, make sure the writing is clear and incorporates any ideas/suggestions made in the writing group.

EDITING:
Use edit sheet to determine if all criteria emphasized for this assignment have been met:

1. Complete sentences (no sentences beginning with "so," "when," "because," "since").
2. No sentences beginning with "and."
3. At least one sentence per paragraph beginning with
   a. *-ly* word
      and
   b. *-ing* word.
4. No misspelled words.

Evaluation

1. Teacher evaluation using rubric for composition part of the assignment:

   a. Topic sentences for each paragraph.

   b. Introductory paragraph listing the items the student wishes to stock (minimum 3/maximum 6).

   c. Persuasive paragraph on the importance of the items stocked to the student's health and happiness in the next stage of existence.

   d. Concluding paragraph pulling together the preparations and the comfort the student feels the *ka* will now have.

2. Teacher evaluation for remaining part of assignment:

   a. Pyramid and floor plan design.

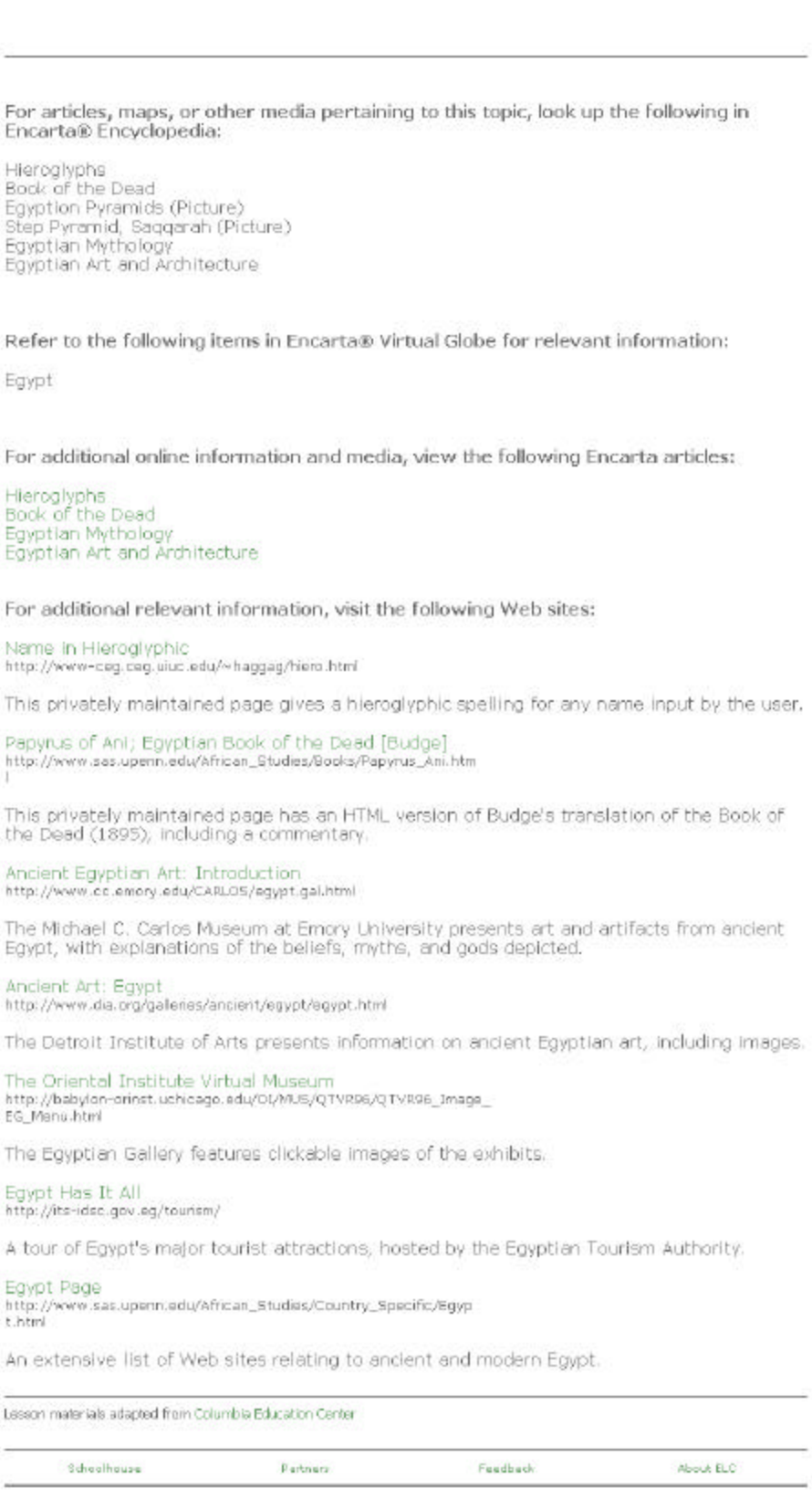
   b. Hieroglyph of name and descriptive sentence.

   c. Wall graphic.

3. Bulletin board display to include each student with his or her "best" of the assignment on display.

Additional material related to the topic is available from within the Encarta encyclopedia.

Relevant links are provided to other web sites where additional material related to the lesson plan are available.



For articles, maps, or other media pertaining to this topic, look up the following in Encarta® Encyclopedia:

Hieroglyphs
Book of the Dead
Egyptian Pyramids (Picture)
Step Pyramid, Saqqarah (Picture)
Egyptian Mythology
Egyptian Art and Architecture

Refer to the following items in Encarta® Virtual Globe for relevant information:

Egypt

For additional online information and media, view the following Encarta articles:

Hieroglyphs
Book of the Dead
Egyptian Mythology
Egyptian Art and Architecture

For additional relevant information, visit the following Web sites:

Name in Hieroglyphic
http://www-cag.csag.uiuc.edu/~haggag/hiero.html

This privately maintained page gives a hieroglyphic spelling for any name input by the user.

Papyrus of Ani; Egyptian Book of the Dead [Budge]
http://www.sas.upenn.edu/African_Studies/Books/Papyrus_Ani.htm
l

This privately maintained page has an HTML version of Budge's translation of the Book of the Dead (1895), including a commentary.

Ancient Egyptian Art: Introduction
http://www.cc.emory.edu/CARLOS/egypt.gal.html

The Michael C. Carlos Museum at Emory University presents art and artifacts from ancient Egypt, with explanations of the beliefs, myths, and gods depicted.

Ancient Art: Egypt
http://www.dia.org/galleries/ancient/egypt/egypt.html

The Detroit Institute of Arts presents information on ancient Egyptian art, including images.

The Oriental Institute Virtual Museum
http://babylon-oriinst.uchicago.edu/OI/MUS/QTVR96/QTVR96_Image_
EG_Menu.html

The Egyptian Gallery features clickable images of the exhibits.

Egypt Has It All
http://its-idsc.gov.eg/tourism/

A tour of Egypt's major tourist attractions, hosted by the Egyptian Tourism Authority.

Egypt Page
http://www.sas.upenn.edu/African_Studies/Country_Specific/Egyp
t.html

An extensive list of Web sites relating to ancient and modern Egypt.

Lesson materials adapted from Columbia Education Center

Schoolhouse Partners Feedback About ELC

Another of the requirements expressed by the Minister and Ministry officials was for the capability to begin to look at student data with the aim of becoming much more data-driven. The Ministry has several options. One, the Ministry can build it's own data warehousing system or it can out-source this task to someone else. A third option is a hybrid of the first two. The Ministry can build its own systems but until such time as it has its own systems fully operational, it can use the services of an outside provider. This allows the Ministry to get up and running fairly quickly. It is recommended that the Ministry look to this third option seriously. Student data is core to the Ministry and some thought should be given to building the internal expertise as well as the systems to allow the Ministry great flexibility in meeting its student record related information needs—this is not a process that the MOE should solely depend on from an outside provider for. This may be a desirable option so as to get up and running quickly and to gain ideas as to how to go about building an internal system. There are two web-based products that will warehouse data and allow users to access and disaggregate data down to the school level via secured servers:

Evaluation Software Publishing
1510 West 34th St
Suite 200
Austin, TX 78703
www.evalsoft.com

EDsmart Inc.
6 Billingsgate
Avon, CT 06001
streifer@erols.com
www.EDsmartinc.com

CRESST has developed QSP (Quality School Portfolio) which will allow districts to import and disaggregate data. For information on QSP contact:

Derek Mitchell
derek@cse.ucla.edu
http://qsp.cse.ucla.edu/

Appendix F contains a listing of both instructional and administrative resources available on the Web.

LOOK TO TECHNOLOGY TO ASSIST IN TRAINING AND SUPPORT

As the Ministry's information systems become more pervasive and complex, it should look to technology to assist in providing timely support in the most cost effective manner possible. Two tools, Microsoft's Systems Management Server, discussed earlier in this document, and NetMeeting can help in this endeavor.

Microsoft Systems Management Server provides an easy, comprehensive solution for centrally managing and troubleshooting networked PCs, and for efficiently distributing software to desktops. It allows staff to detect every machine on the network, conduct software inventories and determine hardware configurations, and send key information back to a central database without the need to send a technician to physically visit each machine. Remote software and hardware inventory that can detect all computers attached to the network, gather

inventory information about both hardware and software, and place this information into an NT SQL database that can be queried. In addition, it allows for unattended electronic software distribution and installation. More information is available at http://www.microsoft.com/smsmgmt/exec/default.asp.

NetMeeting is a multi-media collaboration tool that is available free of charge from Microsoft. It provides the ability to conduct Inter- and Intranet video, phone and audio conferencing. There is an included mail extension that allows individuals using Outlook, to easily initiate NetMeeting calls directly from the common mail directory. Using it data conferencing capabilities, the Ministry can enhance its ability to provide software support to end-users. As an example of how NetMeeting could be used as a support tool consider the following scenario. An end-user at one of the schools calls the help desk asking for assistance on an Excel spreadsheet he or she is working on. Using Outlook, the help desk staff member looks up the end-user in the email address book and initiates a NetMeeting conference call. With the connection established, the help desk staff member remotely takes control of the end-users PC and assists the end-user in completing a complex formula on the spreadsheet. The key concept here is the ability to provide timely support using tools personnel are already familiar with. Additional information on NetMeeting can be found on the Web at http://www.microsoft/netmeeting.

Additionally, it is recommended that Ministry staff acquire software and hardware components that will allow it to experiment with the development of internally designed educational materials. These should be Web based wherever possible. Staff needs to become familiar with these tools, as it is unlikely that the Ministry will be able to find all the resources it needs commercially and will, therefore, need to create some of its own content. These initiatives will require expertise and resources that are likely to be found outside of the Ministry. It is therefore recommended that this process should have the involvement of key master teachers within the Ministry of Education, as well as university personnel and members of the private IT sector. The tools themselves should be acquired with the idea of creating content that brings about the marriage of voice, video and data. As stated earlier they should be Web based where possible but should also be easily transferred over to a CD based format to allow for maximum flexibility. The Ministry has in one of its tender's a list of software titles that will assist in this endeavor. It will also need to acquire the needed hardware to allow the creation of multi-media based content. Companies like Pinnacle Systems, http://www.pinnacle.com would be a good place to start to look to compression and digitizing hardware that will be necessary to make this initiative possible. It cannot be stressed enough how important it will be for the Ministry to begin the process of experimenting with these emerging technologies to stay relevant over time and to begin to develop content that tailored specifically to the needs of Jordan's schools.

Hopefully, it is clear that the acquisition and implementation of these tools provide real value to the organization. It allows staff to provide support in a timely manner often allowing for fixing or repairing of software or hardware to take place without an affected end-user being aware there was a problem in the first place. Also, it allows the MOE to reduce the expense it incurs each time an upgrade needs to be distributed or asset inventory needs to be done. Additionally, it takes advantage of tools already in use, thus reducing the learning curve. Finally, these tools allow an organization to reduce the need for as many qualified personnel because of the

efficiencies wrought by these applications. In short, they reduce the total cost of ownership of the technology being implemented.

To summarize, to develop a good training and support infrastructure consider the following:

- **Standardize on hardware and software:**
  - **Standardize desktop configurations.**
- **Implement a help desk:**
  - **Develop a database of common solutions.**
  - **Create a feedback mechanism.**
- **Look to technology to assist in training and support:**
  - **SMS.**
  - **NetMeeting.**
  - **Internal development of Web based instructional content.**

Security of Information

The Ministry of Education is, as are so many other organizations, relying more on information warehoused in electronic form. This trend will only accelerate as more technology is introduced into the organization. As the Ministry brings more computers come on-line, the ability to restrict access to information will become more difficult. In addition, on-line information will often times be the only place where one can go to get the information they need. Therefore, it is important to note the security of information will become paramount. Security of information, as defined here, comes in two forms — physical and logical.

The MOE needs to acquire hardware that has fault tolerance capabilities built in. That is, the failure of any one component should not mean the loss of information, which might be irreplaceable. It is true that equipment that has such fault tolerant capabilities is more expensive. However, it should be noted that the question that should be asked when deciding on which equipment to purchase is how much is the data being electronically warehoused worth? The purchase of fault tolerant equipment should be viewed the same way as purchasing an insurance policy. It is often painful to pay the premium but sometimes it comes in handy. Fault tolerant hardware should also allow for the remote monitoring and support of the equipment as discussed in the previous training and support section.

The other side to security is more difficult to get ones hands around but is no less important, and that is the logical safeguarding of electronically stored information. At certain points in time people will have legitimate need to access information. Serious effort needs to be put forth to ensure that access to information is done in a deliberate manner. For example, an individual moves from one school to another and into another position. Issues might arise surrounding the need for that individual to gain access to databases at their old place of employment. Also, as schools begin to make the transition to value-add self-service organizations serious consideration will need to be given to what sort of services will be made available to students, staff, and the community at large. Parents will request on-line access to information, especially data on their children. Ensuring the appropriate release of information will become paramount to educational institutions and should be taken into account as systems are developed and put in place. Since the Ministry is already committed to Microsoft for so many of its applications, serious thought should be given to acquiring additional Microsoft products which will integrate tightly with each other. Such software needs to be networking aware, as information is likely to reside anywhere on the MOE network. The tighter the integration of the software being used the easier it is to manage. The goal should be to simplify wherever possible. Finally, where appropriate, purchase software that is database aware.

It is highly recommended that, if the individual does not already exist within the organization, the MOE hire a true certified database administrator, tasked with developing processes and procedures to safeguard the MOE's information. Included in ***Appendix C*** is the job description of a database manager. This individual should also assist in developing policies related to the accessing and using of information on the MOE network. See ***Appendix E*** for an example of a policy that deals with safeguarding of electronic data. Serious effort should be placed in creating policies and administrative regulations related to appropriate use of the Ministry's information systems.

To summarize, to ensure the security of the MOE's electronically stored information consider the following:

- **Acquire hardware that:**
  - **Has built-in fault tolerance components.**
  - **Can be monitored and managed remotely.**
- **Acquire software that:**
  - **Is integrated.**
  - **Is networking aware.**
  - **Is database aware.**
- **Hire certified database administrators.**
- **Create Policies and Administrative regulations detailing how to appropriately use the Ministry's information systems.**
- **Simplify ~ reduce complexity wherever possible.**

Systems Integration

As with security of information, systems integration is composed of two parts. One involves the connecting, at a physical and operational level, of disparate equipment from many manufacturers. The other is the integration of software components that enable the smooth flow of information and bring efficiencies to the organization. Each section will be dealt with in turn, but particular attention should be given to the recommendations provided under the integration of software section.

INTEGRATE AT THE PHYSICAL AND OPERATIONAL LEVEL

Currently, the plan for the Ministry's information systems is to run two platforms operating under separate operating systems until such time as everything can be run from a unified Intel/Windows architecture. Instructional and student record management processes for the most part to operate under a Windows 2000 environment. MOE's business applications and reporting processes are currently running under a Unix environment. There are sufficient differences between the two operating environments that the organization must invest resources in terms of maintenance and to retain expertise in both areas thus adding to the cost of running the MOE's information systems. A quick snapshot reveals the following differences:

- Two different hardware platforms — RISC and Intel.
- Two operating systems — Unix and Windows 2000.
- Two database schemas — Oracle and Windows 2000 SQL.
- Two different skill sets required by staff to manage systems.

These costs are not trivial but what is not so easy to ascertain is the opportunities that are lost because the MOE has two systems in place. The Ministry's technology group should strive to move to a single platform as quickly as possible to achieve economies of scale and begin to take advantage of the opportunities that a unified architecture will provide.

INTEGRATE AT THE BUSINESS APPLICATION LEVEL

Another advantage to the organization of instituting the aforementioned recommendations is that it will allow the MOE to replace the current financial / human resource management information system. The current strategy of upgrading the existing system needs to be reexamined. First, there should be some concern about the MOE's ability to keep the current system in operation. The MOE is having a difficult finding people who can code for this system. Clearly, the liability issues to the organization should be taken into account if there is no one within the organization to keep the system stable and keep adding functionality over time. There should be a review of what benefit is derived from having an internally developed set of applications in light of the concerns related to the current system being able to meet the current needs of the organization.

It is recommended that the MOE look again at the possibility of acquiring a commercial package to manage its business functions. An argument that might arise is that there is no commercial package available that will meet all of MOE's business needs. This is true. However, it is also true that a package like PeopleSoft or SAP will meet needs that that the MOE has but which the current system does not address. As for the rest, the MOE can do what other organizations have done — change the business processes and not modify the code, or modify the code where

there is no alternative. This scenario is probably no worse than what the MOE is currently going through and provides the following benefits:

- Provides the MOE with a robust integrated human resource and financial management package with greater capability than the current system.
- Puts the "power" into the hands of the end-users so that they can do their jobs more efficiently and effectively and not have to rely on the data processing folks for the completion of their tasks.
- Allows the organization to integrate all its information systems under one common operating system, hardware platform, and database.
- Gives the MOE the option to combine two systems and bring economies of scale to the organization.

It should be noted that systems integration is not a trivial undertaking. The MOE should "stack the deck" as much as it can to its favor. When purchasing equipment to run these complex software systems, ensure that the equipment does not become an impediment by buying hardware that has fault tolerant capabilities built in. Also, one operating system will simplify support and fault diagnoses. Look to vendors that are more than one-product suppliers. As stated earlier, the decision to standardize on some Microsoft products is a good one. Additional thought should be given to seeing what other products Microsoft has and determining how they might fit into the MOE's structure. Finally, and this is difficult to quantify, look to vendors that have strategic alliances. For example, look to vendors that have strategic relationships such as Microsoft, Cisco, and Compaq to provide software and hardware systems. These vendors maintain a very close relationship in their respective development cycles. This should translate to a more secure feeling for the MOE that the systems being implemented will continue to work seamlessly over time.

Some consideration should also be given to bringing in, on a case-by-case basis, someone with expertise on the task being worked on by the Ministry. Over the long term, this may be a less expensive than having to continually do rework. In other words, find someone who has already done this, and who can provide you the benefit of his or her experience.

To summarize, to develop an integrated infrastructure consider the following:

- **Standardize on the equipment being used to run the information systems.**
- **Buy hardware and software with "smarts" built in.**
- **Look to vendors that are more than one-product suppliers.**
- **Look to vendors that have long-term and on-going strategic alliances.**

Outsourcing

Outsourcing, in broad terms, is the purchase of goods and services that originally were done in-house. Organizations are increasingly turning to outsourcing but don't seem to understand the issues that must be addressed when entering into these agreements. This section seeks to provide practical guidance and advice when entering into outsourcing agreements. This section will be broken into two parts. The first part will provide a set of guidelines, which the Ministry can use to benchmark its current outsourcing agreements as well as provide a template for future outsourcing contracts. The second part of this section will have specific recommendations on two areas that are of extreme importance — hardware and software.

PART I. GUIDELINES FOR OUTSOURCING

To begin with, the Ministry should have specific business objectives for deciding to outsource services. These should be identified and confirmed in the work undertaken during the business analysis phases prior to selecting a preferred outsourcing services supplier. With that scope of work completed, the major objective remaining is to negotiate a supply agreement with the preferred outsourcer for the delivery of the required services at an agreed cost and level of performance. There are seven components to an agreement achieving this objective. These are:

- **Service specification** - sets out in specific and measurable terms the services required, how they are to be delivered and the duration they are required.
- **Service levels** - set out the performance standards (service levels) that relate to each of the services to be provided.
- **Roles and responsibilities** - document the obligations of the outsourcer and the purchaser and the boundaries of responsibility.
- **Transition period and acceptance** - sets out how any existing services will be handed over to the outsourcer, the services accepted by the purchaser and the transition of staff.
- **Prices, payment and duration** - agrees on the price and payment for delivery of the services, including the basis of charging for any additional or optional services.
- **Agreement administration** - sets out how the agreement will be managed and administered. This will include provision for resolving disputes and the remedies in the event of non-performance.
- **Outsourcing issues** - issues that are specific to outsourcing and will need to be considered during contract negotiations.

Each of these is addressed below.

SERVICE SPECIFICATION

The purchaser will have set out in their RFP the services required. These services may have been specified in some detail or set out in business terms requiring the outsourcer to propose services to meet the business needs. The outsourcer will have submitted and agreed with the purchaser, a detailed proposal setting out how it will provide the services to meet the purchaser's specification of requirements. A comprehensive specification of these services will generally form the basis of the agreement and should set out in some detail:

- The services the outsourcer is required to deliver to the purchaser, including the tasks of the purchaser's work activities such as help desk support or communications administration.
- The deliverables that result from the services provided.
- How the outsource services will be provided to the purchaser.
- How third party suppliers will be managed.
- How problems will be managed and resolved.

The outsourcer may also be contracted to provide other additional services including:

- Training for the purchaser's staff involved with the outsource work activities.
- Advisory services for system enhancements as required, to meet any changes in the purchaser's business needs.

SERVICE LEVELS

A key aspect of any outsource agreement is the development and acceptance of measurable service levels. These are usually attached as schedules to the agreement. The service level schedules specify exactly what services the outsourcer will provide, how often and how the service is delivered and measured.

Service levels should define the standards of service required by the purchaser. These service levels will have been agreed with the users of the services that the outsourcer is to supply.

Setting of service level agreements (SLA's) can be done by benchmarking how other organizations perform certain work activities or, if possible, the purchaser may benchmark against any existing in-house information technology facility.

SLA's should be reasonably flexible agreements between the purchaser and the outsourcer to enable performance adjustment that reflects changing business requirements. A formula for rebates to the purchaser where service levels are regularly not met should be established. This should result in the review process confirming the service levels required or reviewing the charges applying if additional services are being delivered.

Documented service levels for each service should include:

- Measures of successful service delivery (e.g. specify service levels).
- Fault reporting and escalation (who will the problem be escalated to and how will it be resolved when the agreed service levels are not met?)

- The impact on the business if services are not provided to the stated and agreed service levels (any impact on business operations, e.g. invoicing cannot be performed).
- Any financial credits that will apply if the service falls below the agreed service levels system response times for online operations.
- Turnaround times that include pick-up and delivery should batch processing be part of the outsource service .
- Customer care services (e.g. help desks).
- Service availability (after hours maintenance requirements etc.).
- Methodologies for measurement and monitoring of performance.

ROLES AND RESPONSIBILITIES

The roles and responsibilities of both the outsourcer and the purchaser in the delivery of the outsource services must be documented in the agreement.

Roles and responsibilities for the purchaser will include:

- Reasonable access to the purchaser's site as required for the outsourcer.
- The appointment of a suitably qualified and experienced in-house person to act in an account management or relationship management role between the outsourcer and the purchaser.
- Allowance for the outsourcer to conduct due diligence before taking up the agreement to ensure that the purchaser's expectations are reasonable.
- Reasonable access to the information, institutional and business knowledge and documentation of the purchaser's business.
- Timely response to any requests from the outsourcer for information, advice or any action required by the purchaser.
- Negotiating new contracts and the re-negotiation of existing contracts for specified service level agreements with secondary service providers.
- Identification of the staff, if applicable, whom the purchaser would like to transition to the outsourcer.

Roles and responsibilities for the outsourcer will include:

- The appointment of a suitably qualified and experienced account manager to manage the delivery of services and the relationship with the purchaser.
- Delivery of the agreed services.
- Compliance with the purchaser's policies and procedures as they relate to the delivery of services and occupational safety and health.
- Confirming that the skills and competencies of the purchaser's staff, identified by the purchaser as transitional, are appropriate for the delivery of the required services.
- Securing the services of the staff confirmed as transitional.
- The provision of additional and suitably skilled staff to perform the services.
- The management of any agreements with third party suppliers of information technology services.
- Quality assurance of the delivered services.
- Complying with security and confidentiality obligations.
- Reporting on the delivered services.
- Provision of warranties for delivered services.

- Services transfer assistance in the event of termination.

TRANSITION PERIOD AND ACCEPTANCE

Transition management is a key aspect of the process of outsourcing. Transition management should be priced and form a part of the agreement between the outsourcer and the purchaser and appear as a schedule to the agreement as new services. This section deals with the planning and implementation of those new services.

The starting point for detailed planning of transition activities will be the approach outlined by the outsourcer in its proposal. It is likely that further discussions will be required with the outsourcer to confirm the details and fully document the plan prior to inclusion in the agreement. A different transition approach may be required in the case of a new service provision arrangement as compared with the transition from a purchaser provided service.

A further issue will be the redeployment or other options for existing staff. This area is often overlooked by the purchaser and is an area that can cause problems long after an agreement to outsource is signed. Redeployment should be seen as part of the transition costs as it may involve severance payments and possible court settlements if not handled correctly.

The outsource decision can have an adverse impact on the morale and productivity of in-house employees due to the worry of job loss and the possibility that the best people will start looking for other jobs. The purchaser's staff may be reluctant to work for the outsourcer and resign, taking valuable institutional knowledge with them. It will be critical for business continuity to be maintained during the period between the time outsourcing is announced and implemented.

The purchaser and the outsourcer should have a strategy and plan for communicating with affected staff and existing service organizations. This strategy may also need to include a media plan that would seek to keep the public properly informed to protect the purchaser's image.

Training of the outsourcer's staff will also need to be considered in the transition period. The extent to which training of these staff is required may depend on:

- The scope of the services being established.
- Any transfer of the purchaser's staff to the outsourcer.

Who owns any assets associated with the outsourced service needs to be established. If the outsourcer is taking over existing assets from the purchaser, there may be a requirement to formally accept these against a checklist of criteria agreed with the purchaser.

The acceptance process will also include the purchaser monitoring the service delivery for a specified amount of time, or a testing of all key procedures by the purchaser's staff.

The purchaser must make the outsourcer aware of the existence of third party contracts that may impact the way service is delivered.

Once the purchaser is satisfied that the appropriate standards are complied with and that the service performance has reached the required levels, transition is complete and the outsource service can be formally accepted.

PRICES, PAYMENT AND DURATION

Prices and payment terms will be included in the agreement. The pricing may be set out based on a number of different formulae and an agreement will include one or more of these, as appropriate, for each component service. These could include:

- A pricing model for each work activity to be outsourced.
- A total fixed fee for all services provided.
- A specification of which services are part of the agreement and which services will be an additional charge, if required, by the purchaser at a later date.
- Pricing models for any optional services or resources which the purchaser may require and which do not form part of the standard outsourcing service.
- The one-time costs for the transition period.
- A formula for charging for additional services delivered or where service levels are exceeded.
- A formula for rebates that would apply in the event services are not delivered or service levels are not met.
- The basis for a review of charges in the event of any extraordinary reduction or increase of outsourcing work as a result of changes in the purchaser's business.
- A basis for any review of charges over the term of the agreement and any index (e.g. CPI) for capping or linking any increases.
- Any charges that will apply on termination, including any transfer of assets.

The agreement should set out in some detail how the pricing is arrived at and state the assumptions and/or constraints that underpin the model. This will support the calculation of any future variances and will avoid disputes arising from differences in interpretation of the pricing model.

The agreement will also specify the term during which the outsource services will be provided. This may include the basis for any right of renewal of the agreement and any milestones for reviewing the agreement during its term. It may also cover any termination charges for early termination of the agreement by either party.

The procedure for invoicing should be clearly defined, as should the terms of payment.

AGREEMENT ADMINISTRATION

The agreement will set out the processes and timing of the administrative tasks associated with the delivery of services. The outsourcer will be required to monitor its performance against the agreed service levels and report to the purchaser on an agreed basis. The purchaser may also need to put into place its own or independent measures of the services provided. This would then form the basis of regular and

formal meetings between the parties to review performance and to address any areas of concern.

There also needs to be a basis for renewal of the agreement. The negotiations for agreement renewal should commence at a reasonable period before the term expires.

In the event that service delivery does not meet agreed service levels, the agreement should specify the processes and procedures to resolve the issue. These may include escalation procedures within both parties and the circumstances in which escalation will occur.

Alterations to the agreed services or service levels are likely to occur during the term of the agreement. Both parties require procedures for requesting or recommending changes to the quality and scope of the services. These may include:

- Procedures defining what changes are required or recommended.
- How they will be incorporated into the agreement.
- How they will be implemented and accepted by both parties.
- The methods for calculating any variations to the charges.

The obligations of both the outsourcer and the purchaser at the completion or termination of the agreement should be defined. This should specify that:

- All property belonging to the other party is returned in reasonable order with allowance for fair wear and tear.
- All documentation returned to the purchaser is complete and up to date.
- All security controls are handed over.
- Outstanding work and action items are documented.
- All data owned by the purchaser is returned, including any copies held for backup purposes.
- No data belonging to the purchaser is deleted without the purchaser's written advice with the outsourcer then supplying a formal notice stating that this has been done.
- There is a transfer back to the purchaser (or their nominee) of the technical knowledge associated with the outsourced services and an agreed hand-over plan.

OUTSOURCING ISSUES

The scope of every outsourcing agreement will vary according to the requirements of the purchaser and its special business, technical or service needs. The parties to the agreement will need to take these into account in each instance with the appropriate additions to the schedules and clauses to the agreement. Such additions are likely to include:

INSURANCE. The outsourcer should have adequate public liability insurance against loss or liability through injury or damage.

OTHER THIRD PARTY SUPPLIERS. The arrangements as to which party (purchaser or outsourcer) will hold and which party will administer the terms of any agreements currently in place between the purchaser and other third party suppliers.

Maintenance contracts must be transferred to the outsourcer unless the outsourcer has agreed to provide maintenance services for all equipment and software.

SOFTWARE LICENSES. Where software used to provide outsourced services is supplied by third parties, the appropriate licenses must be obtained. Any licenses currently held by the purchaser that relate to services being provided may need to be extended to cover the activities of the outsourcer.

OWNERSHIP OF INFORMATION. The ownership of data and information needs to be agreed upon. Should a dispute arise and the agreement is terminated, it needs to be clearly stated who owns the information and data.

SCOPE OF WORK. Identification of the key work activities to be performed by the outsourcer is essential and is typically set out in the RFP. The purchaser should specify in detail the nature of the services that will be outsourced and the requirements of the purchaser in relation to those outsourced services. The outsourcer will have responded to the RFP with a proposal, setting out how they will perform the work activities. Both the RFP and proposal may be incorporated into the contract to support the definition of the work that must be performed and the requirements that must be met by the outsourcer.
In defining the scope of work the following additional issues should be considered:

- What, if any, technology, personnel or other resources must be provided by the purchaser?
- Will there be any transfer of personnel or assets from the purchaser to the outsourcer? If so, how is that to be achieved? The transfer of personnel is fraught with employment law issues that need to be carefully considered. If information technology facilities are to be provided, where will they be located?
- What will be required to maintain these facilities and who will do the maintenance? Is the outsourcer likely to be reliant on another vendor to provide maintenance?
- Is the outsourcer responsible for information technology planning or will the purchaser do this?
- Is the outsourcer responsible for ongoing system design and system modifications to meet new or changed future requirements of the purchaser? This issue should be made clear during the RFI and RFP stages, but often is not.
- Is the outsourcer responsible for the development of software and if so, is there a component in the charges for this activity?
- What are the procedures for maintenance and support of software? That is, who pays for upgrades and who supports software licensed to the purchaser?
- Who is responsible for disaster recovery/business continuity arrangements?
- Who is responsible for asset replacement, capacity planning and software upgrades, etc?

The parties should recognize that in most cases the purchaser's business requirements will change during the term of the outsourcing arrangements. It is also likely that the technology requirements will change as existing equipment and software becomes outdated or relatively more expensive to support. Over the term

of the agreement, new technology may also become available that reduces the cost of service delivery. There should be provisions that enable either party to request and benefit from additional services, changes to the scope of existing services or the deployment of new technology during the term of the agreement.

CONTRACT DURATION AND COMMENCEMENT. The commencement date of the contract should be decided as early as possible to minimize transition difficulties when service provision is handed from the purchaser to the outsourcer. Given the complex problems that can arise during the hand over of information technology services, it may be prudent to include a defined transition period as part of the term of the contract.

The length of term will depend entirely upon the nature of the outsourced services and the business requirements of the purchaser. From an outsourcer's perspective, the price of the services is likely to be influenced by the capital costs involved in providing the resources required to maintain service delivery. An initial term of three years is typically seen as a minimum term. The terms of renewal should be based on performance and current conditions at the time.

SYSTEM SPECIFICATION. The system specifications should be defined for function, performance and availability as part of the RFI and RFP phases. The service specifications such as response times and system reliability should likewise be defined at the RFI and RFP phases.

SERVICE LEVEL AGREEMENTS. Service level agreements are put in place to define the minimum level of service that must be provided. They are, therefore, the basis for measuring the outsourcer's performance. SLA's will typically be included in the contract schedules and cover a number of areas of service including:

- System availability and response times.
- Quality standards.

Measuring and monitoring service levels can be achieved through user satisfaction surveys and analysis of performance data such as system response and job turn around times.

It is not always easy to identify performance measures that accurately reflect the standard of service required by the purchaser's users. Moreover, SLA's can be ineffective documents unless the purchaser has practical and realistic remedies in the event of non-performance. Such remedies might include the withholding or deduction of agreed rebates from fees otherwise payable to the outsourcer, should the agreed level of performance not be maintained.

Both purchaser and outsourcer need to be aware that SLA's are not inflexible and there should be a review period in the SLA to cover changing purchaser requirements and new technology.

REPORTING AND REVIEW. Closely linked to the SLA is management reporting and review of performance. Procedures for reviewing the performance of the outsourcer should be defined in consultation between the purchaser and the outsourcer during regular meetings. Each party should nominate dedicated representatives who will be

responsible for liaison with the other party's representative and communicating information and decisions.

Such meetings should regularly involve the senior management from both parties and include adequate focus on future developments and forward planning.

SYSTEM ACCESS AND SECURITY. Access to the purchaser systems by the outsourcer needs to be considered in the context of current FERPA legislation, which is intended to protect personal information about identifiable individuals. An outsourcer may only require system access at certain levels to enable them to perform their service. The level of security measures required to protect the purchaser's system and information from unauthorized access will continue to require rigorous planning, implementation and management. Outsourcing services will bring additional issues of protection, confidentiality and ethics that the parties will need to ensure are documented and agreed with regard to their responsibilities and obligations.

FACILITY OWNERSHIP AND CONTROL. If the outsourcer is going to perform certain services using the purchaser's equipment, who will own these assets? The outsourcer may enter into an arrangement to purchase these assets or they may be handed back upon termination of the outsourcing arrangements. In either event a detailed inventory of assets will need to be compiled.

What will be the relationship with suppliers of third party services such as communications or network services? Outsourcers may need to rely on competitors to supply services to enable them to provide service to the purchaser. This may require facilitation by the purchaser.

PERSONNEL ISSUES. Although the issue of personnel is often crucial, those involved in outsourcing sometimes overlook it. People are fundamental to a business and are required to maintain business continuity during the transition period.
The arrangements for the retention, redeployment or other options for existing staff must be negotiated. This issue is critical, as the outsourcer will require the institutional knowledge of the purchaser's staff. Business continuity must be maintained during the transition, which requires that the purchaser's staff be kept fully informed where appropriate.

Staff may need to be transferred from the payroll of the purchaser to the payroll of the outsourcer and a transition plan should be used to minimize the risk of service disruption and employment-related legal claims.

The employment contracts and/or collective agreements under which the purchaser's staffs are employed may require negotiations to be held with the relevant staff or their representatives. The early involvement of professional human resource managers and employment law specialists to advise and assist with contractual and privacy issues is critical to any transition to outsourcing.

The purchaser may also specify that the outsourcer should hire a certain number of staff and the outsourcer may require a certain number of people for the purpose of acquiring system and corporate knowledge. In these cases there should be an agreed process for the outsourcer to select, assess and engage the appropriately skilled staff from the purchaser.

The purchaser should also be made aware if any of the outsourcer's staff are being shared with other clients.

INTELLECTUAL PROPERTY INDEMNITY. Each party should generally indemnify the other against claims of intellectual property rights infringement arising from the use of facilities and resources that they supply to the other as part of the outsourcing arrangements.

WARRANTIES. Appropriate warranties should be provided including:

- Warranty of authorization and title.
- Performance warranty.
- Compliance with specifications.
- Service quality.

DISASTER RECOVERY. Agreement should be reached between the purchaser and the outsourcer concerning business continuity, should any of the outsourcer's facilities fail.

AGREEMENT CHECKLIST

The general provisions of an outsourcing agreement depend on the services to be provided by the outsourcer and the agreement needs to be tailored to the purchaser's specific requirements. The following lists the key clauses and schedules that need to be included in an outsource agreement.

This checklist of outsourcing agreement issues is by no means exhaustive.

TERMS AND CONDITIONS. The general terms and conditions of the agreement set out the majority of the rights and obligations of each party. In an outsourcing agreement the general terms and conditions should typically include:

Preamble	A full description of the parties, the processes leading up to the agreement stage and the essence of the agreement.
Definitions	A precise definition of terms used in the agreement.
Interpretations	Any clarification relating to gender, references, schedules and appendices, other documents, conflicts between documents, etc.
Scope of Services	A general description of the services to be supplied. A full definition of the services and service levels should be provided in a schedule. The agreement must also provide a mechanism to enable the specification of services and service levels to be changed at the request of either party.
Term	A definition of the commencement date and the duration of the agreement. Any provision for extending the term of the agreement.
Prices and Payments	A reference to the schedules to the agreement which should specify services and applicable fees. The invoicing procedure and terms of payment should be defined.

Responsibilities of the Parties	The outsourcer's and purchaser's respective responsibilities during the term of the agreement.
Transition and Acceptance	The arrangements for the transition and acceptance of the services from the purchaser and the commencement of services by the outsourcer.
Staffing	The requirement for appropriately skilled and trained personnel and the removal and replacement of personnel. The identification of any personnel whose availability is essential.
Agreement Administration	How performance of the services will be monitored and reviewed.
Remedies	Practical remedies for breach of the agreement, including failure by the outsourcer to achieve agreed service levels.
Termination	The basis for termination of the agreement (e.g., where the other party is in breach of its obligations under the agreement).
Consequences of Termination	Sets out the consequences of termination - including the basis on which the outsourced services will be handed back to the purchaser or an alternative service provider.
Confidentiality	Requires the parties to keep confidential the information acquired in relation to the other party that is confidential in nature.
Indemnities	Sets out the indemnity that the outsourcer grants the purchaser against claims of infringement arising in relation to services supplied under the agreement. Depending on the nature of the agreement, indemnities against negligent damage and personal injury may also be appropriate.
Warranties	Specifies what the supplier warrants with respect to the agreement. This includes conformity to specification and service levels.
Intellectual Property	Sets out the rights of each party with respect to any intellectual property associated with the delivery of services.
Limitation of Liability	Sets out the extent to which the outsourcer's liability is limited.
Force Majeure	Allows a party to be excused from its failure to perform the agreement where it is prevented from doing so by circumstances beyond its control.
Notices	Specifies how and where any formal notices with respect to the agreement must be communicated to the other party.
Assignment and Subcontracting	Requires each party to obtain the consent of the other party prior to transferring or subcontracting its rights and obligations under the agreement to any other party.
Amendments	Specifies how any subsequent changes to the agreement, as requested by either party, will be handled. (Change Management.)

Dispute Resolution	Defines the processes for both parties to resolve disputes constructively through a defined process. Where possible this process should involve mediation between the parties.
Entire Agreement	Excludes reliance on extraneous material not incorporated in the agreement.

SCHEDULES. Further detail may be included in schedules attached to the agreement and may include:

Services and Service Levels	Comprehensive description of the services and the required service levels.
Service Charges and Payments Schedule	The payments for the services agreed between the parties, including the major milestones relating to signature, implementation, transition, acceptance and regular payments.

PART II. SPECIFIC RECOMMENDATIONS: HARDWARE AND SOFTWARE

There are some things the Ministry can do to reduce the overall costs associated with outsourcing:

STANDARDIZE ON HARDWARE AND SOFTWARE

If the function to be outsourced will be the maintenance of computer hardware, the cost will be lower if the company doing the maintenance work only has to deal with computers from one manufacturer. The outsourcing company will incur lower expenses if it only needs to keeps its staff trained on the computer equipment of one vendor than it otherwise would if it had to have expertise on computers from many vendors. It will also cost less to have replacement stock for one make of computer than for many. This same reasoning holds true for software. It is less expensive to have individuals on staff to support one brand of word processor, for example, than two or three. These lower costs can then be passed on to the Ministry.

NEGOTIATE A SLIDING SCALE CHARGE

Another strategy to employ is to negotiate a sliding scale charge based on the number of machines that are to be supported by the outsourcer. For example, if the Ministry has 1,000 PC's that it wants to put on hardware support, it should expect that the outsourcer would provide a substantially lower per unit maintenance fee. So, instead of, say, $300 per year per machine, it will be a more reasonable $50 per year per machine. The likelihood that all 1,000 machines will fail is not very great. Of course, if these machines are yet to be purchased or leased then it makes sense to negotiate with the vendor the same type of arrangement and buy the maintenance up front for the life of the lease or for at least three years if the equipment is to be purchased.

CONSIDER ENROLLING IN A SELF-MAINTAINER PROGRAM

The Ministry may wish to "outsource" the maintenance of equipment to its own staff. This is an attractive option for those institutions that wish to make money. Compaq, for instance, has a self-maintainer program that allows internal staff to fix their failed

products and they pay $90 for each work order completed. The advantage to the Ministry is that it can take this money and use it for a variety of purposes such as purchasing additional equipment or sending staff to classes to get certified. There is a cost associated in getting staff certified to become a self-maintainer but the Ministry may wish to negotiate this into a purchase or lease contract.

CONSIDER A SELECT® AGREEMENT

Finally, the Ministry should consider enrolling in Microsoft's Select software program. This recommendation is being made because it is not clear exactly what the current agreement for software is with Microsoft, though it is acknowledged there is one. Whatever the agreement, it is unlikely to encompass all the needs that the Ministry will need at some point in time. The Ministry already uses a great deal of Microsoft's product offerings and when all the schools are brought on-line, it will most likely be the single largest user of Microsoft software in the country. It should get the best possible price for the software and this may mean entering into a special arrangement directly with Microsoft. With that said, Microsoft's Select provides for deep discounts on their software, especially to educational institutions. More information on Select is available at Microsoft's Web site located at http://www.microsoft/licensing/.

To summarize, consider the following when looking to outsource support services:

- **Standardize on hardware and software.**
- **Hardware:**
  - **Negotiate a sliding scale charge based on total number of machines.**
  - **If outsourcing internally, consider enrolling in a self-maintainer program.**
- **Software:**
  - **Consider Select ® type agreements.**

Develop A Feedback System for Continuous Improvement

Information Systems are not static—to remain viable they will need to change and adapt over time. The implementation of the following steps will assist the Ministry of Education to construct an information system that proves continuously adaptable.

ANALYZE AND UNDERSTAND THE ORGANIZATION'S INFORMATION FLOW

To ensure that the Ministry can build an information system that can adapt over time and meet the information needs of the organization, it will need to implement a program to continually analyze and understand the organization's information flow. This process must center itself around four key questions:

- Where is the data coming from?
- Who is using it?
- What are the people who receive the data doing with it?
- Should they be receiving it?

EVALUATE AND REDIRECT THE INFORMATION FLOW TO IMPROVE EFFICIENCY

This process will be dynamic, ebbing and flowing, as data is evaluated and the information flow is redirected to improve efficiency. Information should be generated for a single reason: To assist management and staff in attaining stated goals. If the goal is to improve test scores, then one must evaluate data coming in to point out success, failure and potential problem areas ahead. Also, tools must be developed which will point to what works and doesn't work and why (done by getting hard data and personnel together.)

ESTABLISH AN ORGANIZATION BIOFEEDBACK SYSTEM

Place collection points throughout the organization to create a biofeedback system. Such a system should be constructed as part of an ongoing process and not separate and stand-alone. A help desk is a perfect example of a biofeedback system.

USE OFFICE AUTOMATION AS A FACILITATOR OF INFORMATION SYSTEM STRATEGY

This means more than using automation as a secretary's friend, for instance. Office Automation must be used as a tool to move information throughout the organization. Ensure that applications are database aware and use tools that will facilitate the exchange and management of information, i.e., document management software or groupware software that allows for collaboration.

WHO GETS THE INFORMATION AND WHAT LIMITS ARE TO BE PLACED

At certain points in time people will have legitimate need to access information. Serious effort needs to be put forth to ensure that initial access to information is still needed. For example, an individual moves from one school to another and into another position. Issues will arise surrounding the need for that individual to gain access to their old place of employment, for instance. As already discussed elsewhere in this document, consideration needs to be given to hiring a certified database administrator to assist in establishing processes and procedures that take into account the dynamic nature of any organization.

RE-ASSESS AND RE-EVALUATE THE FIRST FOUR STEPS.

Information must constantly be re-evaluated to make sure it empowers rather than hobbles. More and more the world's societies are no longer industrial in nature—they are informational societies. The Ministry must accept that change must be constant and ongoing. It will occur and management must plan for it.

To summarize, consider the following when building a system that will continuously improve:

- **Analyze and understand the organization's flow.**
- **Define up front what is to be monitored.**
- **Evaluation mechanism should have preset review way points.**
- **Feedback system should be incorporated into the business practices of the organization and not be set up as a stand-alone component:**
  - **Incorporate it as part of a help desk system.**
- **Use office automation as a facilitator of the IT strategy.**
- **Evaluation precepts should be re-evaluated regularly.**

APPENDIX A

LOOKING AT NEW WAYS TO MEASURE IT

With an ever-increasing percentage of an educational institution's budget going toward technology, schools are struggling to find ways to measure the value of IT. This has become increasingly difficult and frustrating for both administrative and instructional initiatives. Part of the reason has been that schools have traditionally relied on initial cost formulas, such as low bid pricing, or have used traditional Return On Investment (ROI) attempts to tie specific benefits to specific initiatives. However, the problem with this way of measuring value is that when you don't know what the future brings, there should be a premium on flexibility.

A new budgeting technique known as real-options, which takes into account not just immediate benefits, such as cost savings, but also the future benefits of an investment, should be seriously considered by educational organizations. The real-options approach lends itself to the unknowns of today's critical IT ventures because it allows for the evaluation of projects not just in terms of immediate return but also in terms of future opportunities that the spending might enable.

Traditional measures such as cost-saving ROI just don't work as well as they used to measure the effectiveness of an application or project. That is because some projects such as Web-based applications are as likely to open up new opportunities or improve key metrics, such as customer affinity, as they are to cut the cost of doing business as usual.

For example, many school districts are grappling with how to remain technology relevant and are looking for ways to acquire the appropriate technology. Leasing, a popular approach in the private sector, is often overlooked in education because schools consider only the initial cost of the program and not the long-term benefits that having up to date and relatively maintenance free computing equipment provides. On the application front, many organizations looking to upgrade an application, like Microsoft's Office 2000 for instance, weigh only the initial investment necessary to acquire the number of user licenses required and fail to grasp that an upgrade to this application would not only improve short-term productivity due to the application having self-healing capabilities, but also make it possible for the organization to deploy critical new applications such as Web-based collaboration tools.

In both these examples, the end result revolves around ensuring that end-users remain more productive and quite possibly allow the organization to run its information systems efficiently with a reduced number of hard to find qualified IT personnel. This places the organization in position where its IT professionals participate in helping the organization develop strategic initiatives designed to move the organization forward instead of trying to keep an old and decrepit system from imploding.

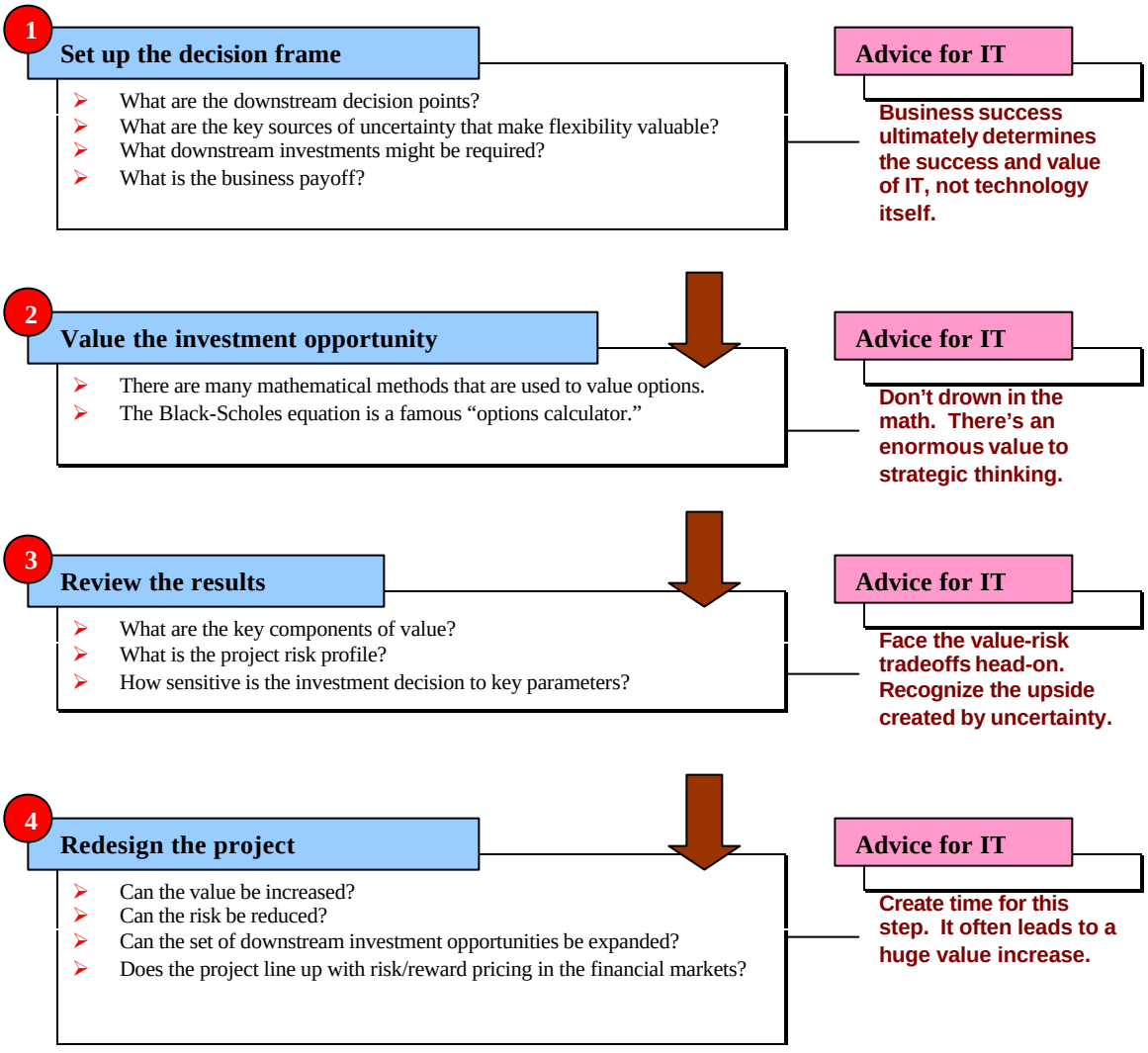
It is rare to find in the education sector, or other industries for that matter, that IT done has a good job of justifying what the actual business payback will be. The common rationale usually revolves around the maxim, "we need to upgrade to the

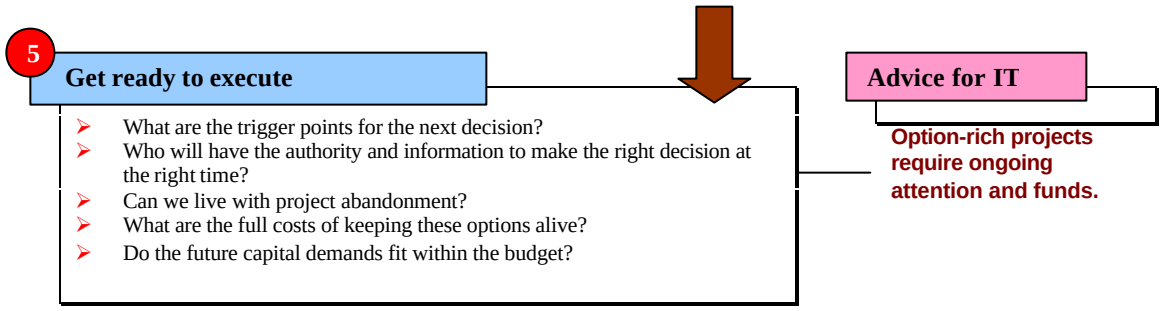
latest version." Management has a need to understand that an upgrade will provide for more than just bells and whistles for a word processor or spreadsheet, for instance. Rather, the upgrade needs to be positioned to show that it will provide for things such as group collaboration—things that change the way people work.

An example of this is the decision to build a network. The initial decision to fund the project provides some benefits. But it also provides an opportunity – not an obligation – to spend money to acquire assets, such as the development of a virtual community uniting the school district with parents and businesses or the capability to conduct distance learning. The secondary benefit is possible only because of the initial investment to build the network in the first place.

Let's look at an example of a real-options approach to a project.

SHOULD WE INVEST IN THIS PROJECT?





The real-options approach acknowledges the uncertainty and volatility of business and IT decisions today. Organizations need the opportunity to change their minds many times from today's plan and still not lose their investment.

This is not to say that the real-options approach is the only method to ensure success. Some organizations, for instance, are transforming budgeting and planning into a continual – not just an annual or quarterly – process. This allows them to switch gears in Internet time without upsetting strategy or hurting the bottom line.

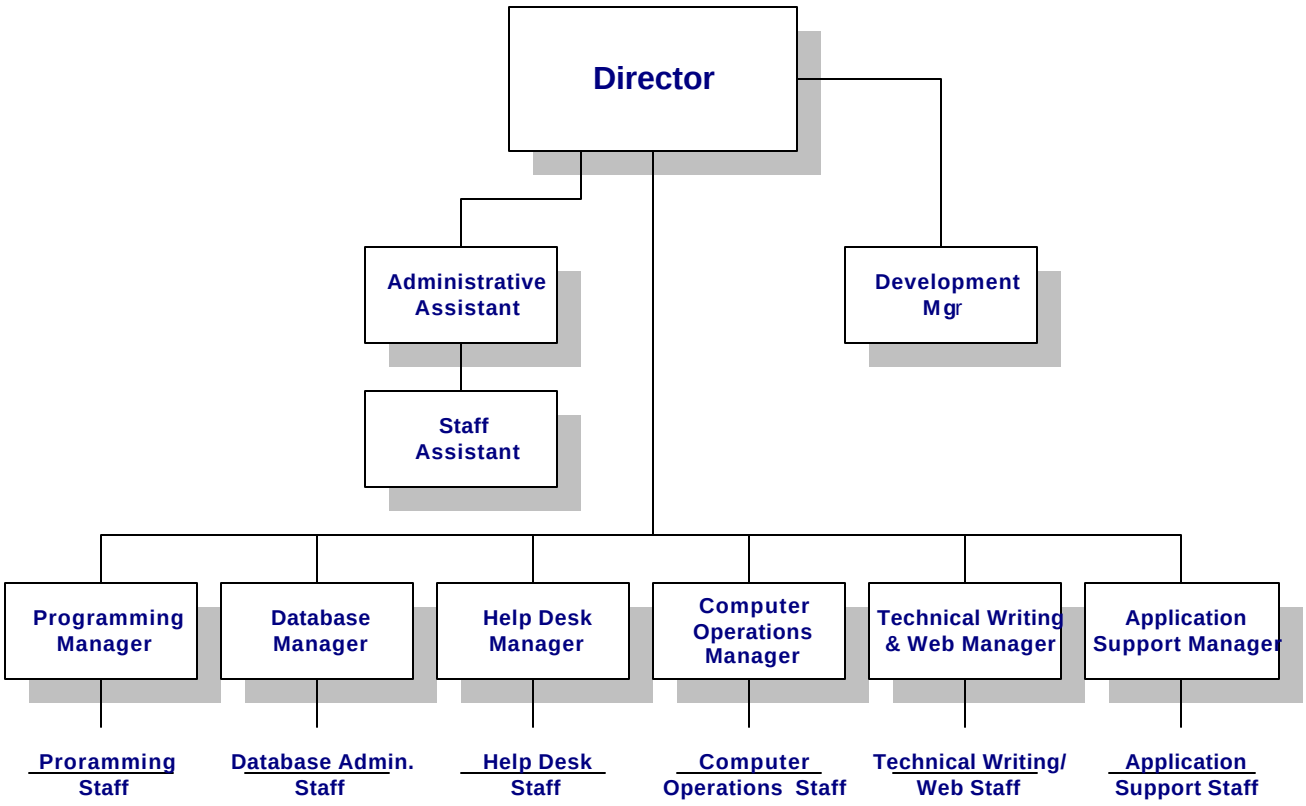
Another approach is to augment traditional ROI-driven decision making by forming steering committees with representation from key business units and IT as well as top management. This approach can ensure that vitally strategic IT projects don't get quashed simply because they don't generate an immediate return. Getting top-line management such as the Governing Board, Superintendent and Cabinet into the budget review cycle is essential. This insures that IT projects are directly linked with the business strategy of the organization. One advantage is that projects that would otherwise get waylaid by some financial justification could be approved because they help move the organization forward in some strategic direction such as getting more direct involvement from the parent community.

Clearly, the current approach employed by educational institutions to determine the value of IT is not working well. The problem will become worse as IT continues to become a core asset to the organization. Part of the solution will require that organizations employ long-term and strategic decisions to the planning, acquisition, deployment, and maintenance of its information systems.

Should you wish to learn more about the real-options approach to budgeting, get a copy of the book co-authored by Martha Amram entitled "Real Options: Managing Strategic Investments in an Uncertain World."

APPENDIX B

PROPOSED REORGANIZATION OF TECHNOLOGY SUPPORT GROUPS



The MOE may wish to create a separate section within this proposed group to provide support specifically related to technology based curriculum instruction and support. This makes sense if the MOE intends to truly integrate the use of technology within the curriculum and if there is a sufficient quantity of staff selected to perform the support. Otherwise, this function can come under the Application Support area.

APPENDIX C

JOB DESCRIPTIONS

The following are a compilation of job descriptions. These might prove useful to the MOE should it decide to reorganize the technology support groups as proposed in ***Appendix B***.

DEVELOPMENT MANAGER

- Prioritizes end-user requests and application enhancements.
- Facilitates communication between users, programmers and database designers.
- Coordinates access to databases.
- Coordinates development standards and testing.

The individual manages the on-going development of current as well as planned projects. The Development Manager reports solely to the Director and fills in for the Director as needed. This individual has a high profile outside of the department, as the position requires constant communication with both inter- and intra-MOE personnel. As such, this position requires good communication and management skills as well as a well-rounded knowledge of information systems and of the organization and its workings. Once a project has been commenced, it is the responsibility of this individual to monitor its progress and, through co-ordination with the Director, allocate resources as needed to insure its success. In many organizations this is administrative position and would fall under the title of Assistant Director.

PROGRAMMING AND ANALYSIS

PROGRAMMING MANAGER

EMERGING TECHNOLOGIES SPECIALIST

PROGRAMMER/ANALYST

PROGRAMMING MANAGER

- Determines need and creates computer programs from scratch using traditional programming languages and emerging programming tools.
- Determines need and enhances existing "canned" computer applications using built-in macro programming languages, DLL's and other object-oriented programming tools.
- Analyzes the current system and reports.
- Studies the functional areas of the organization for which the database is being structured.
- Determines the relationship between data resources.
- Determines data validation and processing requirements.
- Responsible for maintaining the library of shared applications.
- Responsible for maintaining application system documentation, including data dictionaries.

This individual has demonstrated proficiency at the Programmer/Analyst or Application Specialist level (usually both) and has not only accumulated enough knowledge of the organization to provide direction on the implementation and use of relevant emerging hardware and software tools but has also shown the ability to manage projects and people. This position requires a high degree of knowledge of information systems as well as the organization and reports to the Director.

PROGRAMMER/ANALYST

- Determines need, creates and implements computer programs from scratch using traditional as well as emerging programming languages and tools.
- Analyzes the current system and reports.
- Studies the functional areas of the organization for which the database is being structured.
- Determines the relationship between data resources.
- Determines data validation and processing requirements.

Entry Level: This individual works under direction for all phases of a project and is usually limited to working on individual modules.

Intermediate Level: This individual works under direction for all phases of a project but has demonstrated the ability to work on more than one module at a time with some degree of autonomy.

Advanced Level: This individual works under the direction of the Programming Manager and has demonstrated the ability to define scope and sequence of a project. Often, this individual will lead a team of entry and intermediate level Programmer/Analyst's.

EMERGING TECHNOLOGIES SPECIALIST

- Determines need and enhances existing "canned" computer applications using built-in macro programming languages, DLL's and other object-oriented programming tools.
- Analyzes the current system and reports.
- Studies the functional areas of the organization for which the database is being structured.
- Determines the relationship between data resources.
- Determines data validation and processing requirements.

This individual has demonstrated proficiency at the Programmer/Analyst or Application Specialist level (usually both) and has accumulated enough knowledge of the organization to provide direction on the implementation and use of relevant emerging hardware and software tools. As an Emerging Technologies Specialist, this individual reports to the Director and usually works on "futures" projects. This position requires a high degree of knowledge of information systems as well as the organization. In other organizations, this position would be the equivalent of a "Fellows" program.

PROGRAMMING/APPLICATIONS STRUCTURE

Director

Programming Manager

Emerging Technologies Specialist

Programmer/ Analyst

COMPUTER OPERATIONS

COMPUTER OPERATIONS MANAGER

LAN SYSTEMS TECHNICIANS

COMPUTER OPERATOR

COMPUTER OPERATIONS MANAGER

- Responsible for system security.
- Responsible for operating system.
- Provides access to LAN with appropriate security, database and directory rights access for groups and individuals.
- Responsible for backups and recovery.
- Responsible for insuring appropriate software revisions are installed.
- Responsible for print spooling management.
- LAN communication hardware
- Responsible for fault isolation and repair of following:
  - File server disk subsystems.
  - File server computer.
  - Workstations.
  - Disk sub-systems.
  - Display stations.
  - Communication hardware.
- Responsible for batch processing for end-user departments.
- Conducts systems software evaluations and makes recommendations.

This individual has demonstrated proficiency at the LAN Systems Technician and Computer Operator level and has not only accumulated enough knowledge of the organization to provide direction on the implementation and use of relevant emerging hardware and software tools but has also shown the ability to manage projects and people. This position requires a high degree of knowledge of hardware, software and operating systems as well as the organization and reports to the Director.

LAN SYSTEMS TECHNICIAN

- Maintains LAN systems using hardware and software diagnostic tools.
- Conducts backups and recovery.
- Installs appropriate software revisions.
- Maintains print spooling management system.
- Conducts fault isolation and repair of following:
  - File server disk subsystems.
  - File server computer.
  - Workstations.
  - LAN communication hardware.

Entry Level: This individual works under direction for all phases of LAN maintenance and is usually limited to hardware component level diagnostics.

Intermediate Level: This individual works under direction for all phases of LAN maintenance but has demonstrated limited mastery of software level diagnostics.

Advanced Level: This individual works under the direction of the Computer Operations Manager and has demonstrated proficiency of hardware and software diagnostics. Also, this individual has demonstrated sufficient knowledge to understand the interdependencies of application software to that of LAN systems. At this level a thorough knowledge of operating systems is expected. Often, this individual will lead of team of entry and intermediate level LAN Systems Technicians.

COMPUTER OPERATOR

- Conducts backups and recovery.
- Installs appropriate software revisions.
- Conducts fault isolation and/or repair of following:
  - Disk sub-systems.
  - Display stations.
  - Communication hardware.
- Conducts batch processing for end-user departments.
- Conducts system tuning.
- Maintains optimum processing efficiency of system.

Entry Level: This individual works under direction for all phases of computer operations and is usually limited to the hardware component level.

Intermediate Level: This individual works under direction for all phases of computer operations but has demonstrated limited mastery of software level components.

Advanced Level: This individual works under the direction of the Computer Operations Manager and has demonstrated proficiency of both hardware and software components. Also, this individual has demonstrated sufficient knowledge to understand the interdependencies of application software to that of computer systems. At this level a thorough knowledge of operating systems is expected. Often, this individual will lead of team of entry and intermediate level Computer Operators.

Computer Operations Structure

Director

Computer Operations Manager

LAN Systems Technician

Computer Operator

DATABASE ADMINISTRATION

DATABASE MANAGER

DATABASE ANALYSTS

DATABASE MANAGER

- Responsible for database system tuning.
- Responsible for maintaining optimum processing efficiency of system.
- Responsible for providing access to databases with appropriate security, database and directory rights access for groups and individuals.

This individual has demonstrated proficiency at the Database Analyst level and has not only accumulated enough knowledge of the organization to provide direction on the implementation database schemas and also be conversant with database management tools but has also shown the ability to manage projects and people. This position requires a high degree of knowledge of databases and operating systems as well as the organization and reports to the Director.

DATABASE ANALYST

- Conducts database system tuning.
- Maintains optimum processing efficiency of system.
- Provides access to databases with appropriate security, database and directory rights access for groups and individuals.

Entry Level: This individual works under direction for all phases of database management operations.

Intermediate Level: This individual works under direction for all phases of database management operations but has demonstrated limited mastery of database tuning and security management.

Advanced Level: This individual works under the direction of the Database Manager and has demonstrated proficiency at all levels of database management. Also, this individual has demonstrated sufficient knowledge to understand the interdependencies of database application software to that of computer systems. At this level a thorough knowledge of database systems as well as limited operating systems knowledge is expected. Often, this individual will lead of team of entry and intermediate level Database Analysts.

DATABASE ADMINISTRATION STRUCTURE

Director

Database Manager

Database Analyst

HELP DESK

HELP DESK MANAGER

HELP DESK SPECIALIST

HELP DESK MANAGER

- Responsible for first level end-user support.
- Responsible for help desk documentation.
- Responsible for creating application procedures.
- Responsible for maintaining help desk support database.

This individual has demonstrated proficiency at the Help Desk Specialist level and has not only accumulated enough knowledge of the organization to provide direction on the implementation of help desk support programs but has also shown the ability to manage projects and people. This position requires a high degree of knowledge of organizational procedures and reports to the Director. Because this job requires extensive interaction with end-users and vendors, it is imperative that this individual be equipped with good oral and written communication skills.

HELP DESK SPECIALIST

- Conducts end-user support through the use of help desk software.
- Creates help desk documentation.
- Creates application procedures.
- Provides first level end-user support.
- Updates and maintains the help desk database.

Entry Level: This individual works under direction for all phases of providing first level support.

Intermediate Level: This individual works under direction for all phases of first level support but has demonstrated limited proficiency in creating documentation and procedure manuals.

Advanced Level: This individual works under the direction of the Help Desk Manager and has demonstrated proficiency of help desk support practices as well as in creating documentation and procedure manuals. Also, this individual has demonstrated sufficient knowledge to understand the interdependencies of application software to that of computer systems. At this level a thorough knowledge of organizational procedures is expected. Often, this individual will lead of team of entry and intermediate level Help Desk Specialists.

HELP DESK STRUCTURE

Director

Help Desk Manager

Help Desk Specialist

APPLICATIONS SUPPORT

APPLICATIONS SUPPORT MANAGER

APPLICATIONS SUPPORT SPECIALIST

APPLICATIONS SUPPORT MANAGER

- Responsible for end-user training.
- Responsible for application documentation.
- Responsible for creating application procedures.
- Responsible for providing second level end-user support.
- Responsible for evaluating in-house developed and "canned" software.
- Liaison with application vendors for problem determination and resolution of software applications.

This individual has demonstrated proficiency at the Application Support Specialist level and has not only accumulated enough knowledge of the organization to provide direction on the implementation of training and support programs but has also shown the ability to manage projects and people. This position requires a high degree of knowledge of organizational procedures and reports to the Director. Because this job requires extensive interaction with end-users and vendors, it is imperative that this individual be equipped with good oral and written communication skills.

APPLICATIONS SUPPORT SPECIALIST

- Conducts end-user training.
- Creates application documentation.
- Creates application procedures.
- Provides second level end-user support.
- Evaluates in-house developed and "canned" software.
- Conducts problem determination and resolution with application vendors.

Entry Level: This individual works under direction for all phases of training and support.

Intermediate Level: This individual works under direction for all phases of training and support but has demonstrated limited proficiency in creating and documentation and procedure manuals.

Advanced Level: This individual works under the direction of the Application Support Manager and has demonstrated proficiency of training and support practices as well as in creating documentation and procedure manuals. Also, this individual has demonstrated sufficient knowledge to understand the interdependencies of application software to that of computer systems. At this level a thorough knowledge of organizational procedures is expected. Often, this individual will lead of team of entry and intermediate level Application Support Specialists.

APPLICATIONS SUPPORT STRUCTURE

Director

Applications Support Manager

Application Support Specialist

TECHNICAL WRITING
~
WEB MANAGEMENT

TECHNICAL WRITING OR WEB MANAGER

TECHNICAL WRITING OR WEB SPECIALIST

TECHNICAL WRITING AND/OR WEB MANAGER

- Responsible for gathering, analyzing and distributing technical information to end-users.
- Responsible for system and software documentation, technical manuals and training materials.
- Responsible for creating technical reports, product support manuals, scripts for training, proposals and requests for proposals.
- Responsible for providing HTML end-user support.
- Responsible for in-house developed Web content.

This individual has demonstrated proficiency at the Technical Writing and/or Web Specialist level and has not only accumulated enough knowledge of the organization to provide direction on the implementation of Web programs, technical writing, system and software documentation, but has also shown the ability to manage projects and people. This position requires a high degree of knowledge of organizational procedures and reports to the Director. Because this job requires extensive interaction with end-users, it is imperative that this individual be equipped with good oral and written communication skills.

TECHNICAL WRITING AND/OR WEB SPECIALIST

- Gathers, analyzes and distributes technical information to end-users.
- Creates system and software documentation, technical manuals and training materials.
- Creates technical reports, product support manuals, scripts for training, proposals and requests for proposals.
- Provides HTML end-user support.
- Develops in-house Web software.

Entry Level: This individual works under direction for all phases of technical writing, web design, and HTML support.

Intermediate Level: This individual works under direction for all technical writing, web design, and HTML support, but has demonstrated limited proficiency in creating and documentation and procedure manuals.

Advanced Level: This individual works under the direction of the Technical Writing and/or Web Manager and has demonstrated proficiency all phases of technical writing, web design, and HTML support, as well as in creating documentation and procedure manuals. Also, this individual has demonstrated sufficient knowledge to

understand the interdependencies of application software to that of computer systems. At this level a thorough knowledge of organizational procedures is expected. Often, this individual will lead of team of entry and intermediate level Technical Writing and/or Web Management Specialists.

TECHNICAL WRITING AND/OR WEB MANAGEMENT STRUCTURE

Director

Technical Writing and/or Web Manager

Technical Writing and/or Web Specialist

APPENDIX D

AFTER ACTION REVIEW

The purpose of the After Action Review (***AAR***) is to write a history, one that will help Ministry staff to work smarter both in the present and the future. The future benefits are fairly obvious: as ***AAR***'s accumulate, staff will have a base of information to use as a resource when approaching the same or like situations in the future. ***AAR***'s will help in developing strategies, understand more completely where staff have been, and be an invaluable tool for seeing how we might get to where we want to be in the future. As well, new employees will have a collected source of information to help them to understand their new positions more quickly and fully, allowing them to be more efficient from the first day on the job. ***AAR***'s will be an essential part in the Ministry's collection, dissemination, and communication of information.

But ***AAR***'s are also a tool of the present. Writing is a thinking/reflective process. One learns through recollection and reflection. ***AAR***'s force staff to take time to think and reflect in a more structured setting with the ultimate goal being to work smarter. In the fast paced environment of Information Technology, where obsolescence seems only a breath away, it is easy to get into the pattern of react, react, and react. ***AAR***'s will hopefully help to break that pattern, so mistakes are not repeated, and as stated earlier, help in working smarter.

At first, it will take some time to work through an ***AAR***'s five questions, adjusting the level of detail desired in each, as staff develops its sense of what an ***AAR*** should be. Remember that ***AAR***'s are for projects and tasks, not for day-to-day situations. The length of time targeted for completing an ***AAR*** is 20-30 minutes. This might be unrealistic for the first few ***AAR***'s that staff struggle to complete; however, once staff have experience in writing a couple of ***AAR***'s, get into the flow, get a sense of the information needed, internalize the process, discuss ***AAR***'s with colleagues, this is a reasonable time framework. The ***AAR*** is a tool to record the organization's history and is to be used as an instrument to help move the organization forward and work smarter.

COMPONENTS OF AN AAR

HEADING: 12 digit #: ITYearMoDa-xx

Description

Keywords
Area(s) that worked on task or problem
Name(s) of person(s) who worked on task or problem

BODY: FIVE MAJOR QUESTIONS:

1. What did we do?

A brief description of the problem or task, and what was done.

2. Why did we do it that way?

Present the logic used or the procedures or steps followed in your attempt to resolve the problem or complete the task.

3. What happened?

Describe what happened as you proceeded in your attempt to resolve the problem or complete the task.

4. Why did it happen?

This is the serious reflective part. Try to describe the forces and interactions, the causes and effects that shaped your interaction.

5. How can we do it better in the future?

Give suggestions on what might be done or steps that might be taken to more quickly resolve the problem or accomplish the task, or stop the problem from occurring or the need for the project to be done again.

EXAMPLE OF AN AAR

In Process Action Report

6/17/97

Description

Listings and Labels were produced for all 7th grade minority students with a GPA of 3.0 or greater. All 7th grade ranking was re-run prior to the creation of the report to insure the most accurate data was available.

What did we do?

Jim Hopkin requested a list and labels for all current 7th grade minority students (ethnic code 2, 3, 4) with a GPA of 3.0 or greater. Rankings were re-run at all middle schools for grade 7. VBReports was then utilized to produce both the listings and the labels.

Why did we do it that way?

The ranking was re-run to insure the most accurate data available. VBReports was utilized to produce the labels on Avery 5160 labels.

What happened?

A check was made of the report to insure that the correct ethnic codes and GPA were given. He did receive the ethnic groups he requested and the data did reflect a GPA of 3.0 or greater. Dolores took a copy of the report and double-checked it to insure accurate data was given. It appeared that too many students appeared on the report for the ethnic codes selected and started checking the GPA. It was discovered that most middle schools failed to give a final grade for Year-Long classes. A memo had been sent to all sites on Monday, May 12th by Application Support stressing the importance of giving final grades.

Why did it happen?

Because many of the schools failed to give final grades, the GPA calculation process only took into consideration those courses that had final grades posted. This skewed the GPA because it eliminated classes with no grade.

How can we do it better in the future?

The grade scanning program will be modified to alert the user that no final grade for the class duration has been given. No grades will be posted for the student in question for that class grading period. This will hopefully insure that the schools will send the scan sheets back to the teachers for final grades. We will also need to provide additional training for the office staff and make attendance mandatory.

APPENDIX E

USEFUL POLICIES

The following policy examples might prove useful to the Ministry. They deal with software copyright issues and the protection of electronically stored data.

COMPUTER SOFTWARE COPYRIGHTS

Respect for intellectual labor and creativity is vital to academic discourse and enterprise. This principle applies to works of all authors in all media. It encompasses respect for the right to acknowledgment, right to privacy, and right to determine the form, manner, and terms of publication and distribution.

Because electronic information is volatile and easily reproduced, respect for the work and personal expression of others is especially critical in computer environments. Plagiarism, invasion of privacy, unauthorized access, and trade secret and copyright violations may be grounds for sanctions against employees and students.

Employees and students are required to adhere to any specific conditions or restrictions required by the licensing agreements for software programs purchased with MOE funds. For commonly used licensing agreements, the following conditions apply:

1. It is illegal to copy a software program when not expressly provided for in the licensing agreement. It is illegal to install a software program, which is licensed for single computer use, for multiple computer use.
2. Unauthorized copies of software programs may not be used on MOE equipment notwithstanding the source of the unauthorized copy.
3. Purchase of the appropriate number of copies of a software program is legally required, especially if machines connected to a network are used.
4. Employees and students are prohibited from assisting in making or knowingly using illegal copies of software.
5. Employees and students are permitted to make an archival (back-up) copy of a software program, provided it is not used or transferred separately from the original program.

Legal Reference: USCA Title 17 Copyrights. §117. Scope of exclusive rights: Use in conjunction with computers and similar information systems

COMPUTER DATA PROTECTION

Electronically stored data, which may include sensitive, confidential records or official public records, are a vital part of Ministry of Education management.

Authorized access, modification, copying and deletion of electronically stored data allow the Ministry of Education to effectively and efficiently complete the instructional and managerial functions of the Ministry.

No person shall, without proper Ministry authorization, disclose or use a Ministry computer password; enter posted Ministry areas with computer equipment; use or remove Ministry computer equipment; or, access, modify, copy or delete Ministry electronically stored data.

Electronic mail, both written and voice communications, as well as information in an employee's personal storage area are confidential, private information.
Unauthorized acts by students and Ministry employees, which violate this policy, will be grounds for disciplinary action including the immediate initiation of disciplinary and termination proceedings. Where such unauthorized actions constitute a crime the Ministry will vigorously pursue criminal prosecution of any person committing such act.

APPENDIX F

RESOURCES

ASSESSMENT

Access Colorado Library &Information Network
http://www.aclin.org/sarb/assmt/pdf/leadsh.pdf

Achieve
A resource for the creation and revision of academic standards and assessments; interactive.
http://www.achieve.org/

An Introduction to Program Evaluation for Classroom Teachers
Fleischman, Howard L., Williams, Laura. Development Associates, Inc.
http://www.teacherpathfinder.org/School/assess/assess.html
Annenberg Institute for School Reform
http://www.aisr.brown.edu
Looking at Student Work
http://www.aisr.brown.edu/html/LSW/home.html

Assessment Strategies and Definitions
RMC Research Corporation
http://www.rmcdenver.com/useguide/assessme/definiti.htm

Assessment Training Institute
Learning Team Training Guide to Accompany *Student-Centered Classroom Assessment*
http://www.aclin.org/sarb/assmt/pdf/l_team.pdf
http://www.prc.com/ees/assessment.html
http://www.ctb.com/CTB_ftp/ATIWorkshop.pdf

The Center on Learning, Assessment, and School Structure (CLASS)
http://www.assessmentinst.com/

Classroom Assessment
http://www.aclin.org/sarb/assmt/pdf/l_team.pdf

Coalition of Essential Schools:
http://www.essentialschools.org

CRESST
National Center for Research on Evaluation, Standards, and Student Testing
http://cresst96.cse.ucla.edu/

CTB/McGraw-Hill
http://www.ctb.com/CTB_ftp/ATIWorkshop.pdf

Drawing Value From Evaluation
http://www.ssta.sk.ca/research/evaluation_and_reporting/92-09.htm#9d

EdWeek
http://www.edweek.org

Equity and Assessment
http://www.ncrel.org/sdrs/areas/stw_esys/4assess.htm

ERIC Clearinghouse on Assessment and Evaluation
http://www.ericae.net/

ERIC Hotlist on Assessment
http://ericae.net/intass.htm

Educational Testing Service
The United States' largest testing organization, ETS provides lots of useful analysis of test results and their implications for education policy.
http://www.ets.org/research/pic/testing/tmtpreack.html

FairTest: The National Center for Fair & Open Testing:
http://www.fairtest.org/

Fordham Standards Report: The Best State Standards
http://edexcellence.net/standards/best.html

A Framework for Accountability
http://www.aisr.brown.edu/html/tools/framework

Goals 2000:Educate America Act
http://www.ed.gov/legislation/GOALS2000/TheAct/index.html

How Can I Ensure the Integrity of My Assessments? Guidelines for Appropriate Assessment
RMC Research Corporation
http://www.rmcdenver.com/useguide/assessme/gideline.htm

Institute for Research on Learning (IRL)
http://www.irl.org/assess/assess.html

Leadership for Excellence in Assessment
http://www.aclin.org/sarb/assmt/pdf/leadsh.pdf

Los Angeles Learning Center Alternative Assessment Guidebook
National Center for Research on Evaluation, Standards, and Student Testing.
http://cresst96.cse.ucla.edu/CRESST/Sample/GBTHREE.PDF

National Assessment Governing Board
NAGB also publishes the Nation's Report Card through the National Assessment of Educational Progress (NAEP).
http://www.nagb.org/pubs/reading/readcont.html

The Nation's Report Card
http://nces.ed.gov/nationsreportcard/site/home.asp

National Assessment Governing Board
http://www.nagb.org/

NCREL Pathways to School Improvement: Assessment
North Central Regional Educational Laboratory
http://www.ncrel.org/sdrs/areas/as0cont.htm

NWREL Library in the Sky: Assessment
North West Regional Educational Laboratory
http://www.nwrel.org/sky/office/teacher/assessment_information/assessment_information.html

NWREL Assessment Toolkit
North West Regional Educational Laboratory
http://www.nwrel.org/eval/toolkit98

Pathfinder: Assessment
http://teacherpathfinder.org/School/Assess/assessmt.html

Standards & Assessment Resource Bank
http://www.aclin.org/sarb/

WestEd Regional Education Laboratory
http://www.wested.org/

DATA AND INFORMATION TECHNOLOGIES

Basic Data Elements for Elementary and Secondary Education Information Systems
Publication NCES 97-531, prepared by the Core Data Task Force of the National Education Statistics Agenda Committee (NESAC), National Forum on Education Statistics. Washington, D.C.: National Center for Education Statistics, July 1997.
Price: $20.00

Beyond Test Scores
Education Vital Signs, The American School Board Journal
http://www.asbj.com/evs/97/beyondtestscores.html

Connecting Curriculum and Technology
http://cnets.iste.org

High Performance Learning Communities Project
Research, Policy and Practice, International (RPP)
http://www.rppintl.com/hplc/principlesframe.htm

Indicators of Engaged Learning
Plugging In: Choosing and Using Educational Technology
Council for Educational Development and Research, NCREL
http://www.rmcdenver.com/useguide/assessme/engaged.htm

Technology and School Reform
A rich annotated list of resources from Armadillo.
http://www.rice.edu/armadillo/About/reform.html

Using Data for School Improvement
Kate Jamentz
http://www.aisr.brown.edu/html/tools/images/using_data4.pdf

INSTRUCTION AND LEARNING:

Helping Students Learn:An Online Anthology on Student Achievement
http://www.asbj.com/achievement/

A "How To"Guide To Contextual Learning and Curriculum Integration
Colorado Department of Education
http://www.aclin.org/sarb/linkages/pdf/wkbkfnl.pdf

How to Use Problem-Based Learning in the Classroom
Association for Supervision and Curriculum Development
http://www.ascd.org

Pennsylvania Department of Education
Resource Kits
http://www.pde.psu.edu/connections/default.htm

Planning Rigorous and Relevant Instruction – A Resource Kit
International Center for Leadership in Education, Inc.
http://www.daggett.com

Standards-Based Instruction
RMC Research Corporation
http://www.rmcdenver.com/useguide/lessons/lindex.htm

What Happens Between Assessments
http://www.ascd.org/pubs/el/dec96/mctighe.html

STANDARDS

Achieve Standards Clearinghouse
The Standards Clearinghouse is an online database that organizes academic standards in mathematics, English/language arts, science history, and social science state by state, grade level by grade level, and subject by subject. This unique site is a tool for researching and comparing academic *standards* and *assessments*. At the present time, the site includes state standards and student work and are developing sample assessment questions, student work with scoring comments, and information on accountability measures.
http://www.achieve.org/achieve/achievestart.nsf/pages/clearinghome

AFT Teacher Standards
"Standards for Teacher Competence in Educational Assessment of Students" is available through the AFT at: 555 New Jersey Avenue, NW, Washington, DC 20001, (202) 879-4400

Read AFT's "Criteria for High-Quality Standards," from their Academic Standards page, along with a research piece, "High Academic Standards Work –Here's the Evidence."

http://www.aft.org/edissues/standards/index.htm
http://www.aft.org/page39.htm

Council for Basic Education
http://www.c-b-e.org/stserv.htm

SUBJECT AREA PROJECTS / STANDARDS

Mathematically Correct
http://www.mathematicallycorrect.com/

National Council for Teachers of Mathematics (NCTM)
http://www.nctm.org/

"The New, Improved History Standards," by Diane Ravitch and Arthur Schlesinger, Jr., *The Wall Street Journa*l.
http://edexcellence.net/library/histstan.html

Science Assessment
http://project2061.aaas.org/tools/bluepol/Assessm/text.html

"State English Standards," by Sandra Stotsky, *Fordham Repor*t.
http://edexcellence.net/stotsky/stottoc.html

"State Math Standards," by Ralph A. Raimi and Lawrence S. Braden, *Fordham Repor*t.
http://edexcellence.net/standards/math.html

"State History Standards," by David W. Saxe, *Fordham Report.*
http://edexcellence.net/standards/history.html
"State Science Standards," by Lawrence S. Lerner, *Fordham Repor*t.
http://edexcellence.net/standards/science.html

TIME / FINDING TIME / RESTRUCTURING TIME

Assessment Barriers
http://cresst96.cse.ucla.edu/CRESST/Sample/GBTHREE.PDF

Assessment Training Institute
http://www.assessmentinst.com/
http://www.ctb.com/CTB_ftp/ATIWorkshop.pdf

Brown Institute
http://www.aisr.brown.edu/html/tools/tooltypes3.html#time

Coalition for Essential Schools School Scheduling Ideas
http://www.essentialschools.org/fieldbook/strategies/structures/scheduling.html

NCREL
Time for Learning
http://www.ncrel.org/sdrs/areas/issues/envrnmnt/go/94-4sprk.htm

Scheduling
http://www.essentialschools.org/fieldbook/strategies/structures/scheduling.html

VALUE ADD RESOURCES

http://www.aasa.org/sa/membersonly/dec9808.html
http://www.heartland.org/education/april/bad.htm

RECOMMENDED BOOKS & ARTICLES

Herman, Joan. *Assessing New Assessments: How Do They Measure Up?* 1990, Los Angeles: UCLA Graduate School of Education, (310) 206-1532.

National Forum on Assessment, *Principles and Indicators for Student Assessment Systems* (Cambridge, Mass.: FairTest, 1995). Principles can be purchased for $10 from FairTest, 342 Broadway, Cambridge, MA 02139.

"Practicing What We Preach: Why We Need Standards for Instructional and Assessment Design,"(December 1996) in *Educational Leadershi*p. 54, 4: 18-25 [This is a theme issue entitled "Teaching for Authentic Student Performance."]

Staytor, Francine and Johnston, Peter. "Evaluating the Teaching and Learning of Literacy," in Timothy Shanahan, (Ed.), Reading and Writing Together: New Perspectives for the Classroom, 1990, Christopher-Gordon Publishers.

Stiggins, R.J., & Conklin, N.F. *In Teachers' Hands: Investigating the Practices of Classroom Assessment.* Albany: State University of New York Press. 1992

Wiggins, Grant. *Assessing Student Performance: Exploring the Purpose and Limits of Testing.* San Francisco: Jossey-Bass Publishers, 1993.

Wiggins, Grant . *Educative Assessment: Assessment to Improve and Inform Learnin*g, Jossey-Bass Publishers, San Francisco, CA.

"Work Standards: Why We Need Standards for Instructional and Assessment Design," (September 1997) in *NASSP Bulleti*n. [This is a theme issue entitled Standards-Based Education.]

VIDEO RESOURCES

Northwest Regional Educational Laboratory Videotapes on Assessment (ten videotapes available separately or as a set of ten). Contact IOX Assessment Associates, 5420 McConnell Ave., Los Angeles, CA 90066, (213) 822-3275

Materials available on assessment reform from The Center on Learning, Assessment, and School Structure (CLASS). Print samplers and guidance on assessment design: tasks, rubrics, portfolios, design templates, grading and reporting, performance-based curriculum design.
http://www.assessmentinst.com/

Washor, E., "Show, Don't Tell: Video and Accountability," Coalition of Schools,
http://www.essentialschools.org/pubs/exhib_schdes/showvid.html

Two types of supplementary materials are available to support *Student-Centered Classroom Assessment.* For further details about these materials, contact the Assessment Training Institute directly at 800-480-3060 or 503-228-3060,fax: 503-228-3014,
e-mail: 73704.2432@compuserve.com.

Creating Sound Classroom Assessments (60-minute video and trainer 's guide). This interactive video and its associated training materials clarify for teachers and administrators the meaning of quality assessment and how to meet quality standards. It covers five specific standards which can be used anywhere to check the dependability of paper-and-pencil or performance assessments. This package also introduces the idea of turning the classroom assessment process into an effective teaching tool.

Assessing Reasoning in the Classroom (60-minute video and trainer 's guide). This video builds on the information in *Creating Sound Classroom Assessments* to provide a four-part illustration of what it means to be a proficient reasoner and problem solver. It offers practical suggestions for using quality classroom assessments to help teachers teach reasoning and students succeed as problem solvers.